The Electrical Industry's Weekly Magazine

August 22, 1960

Electrical World

Price 50 Cents

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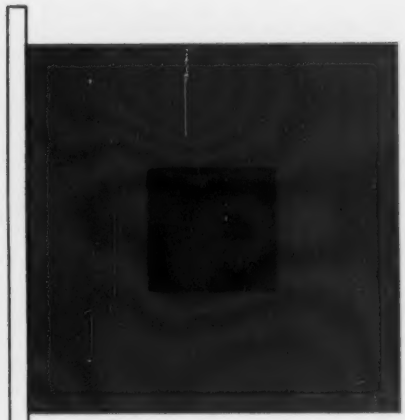

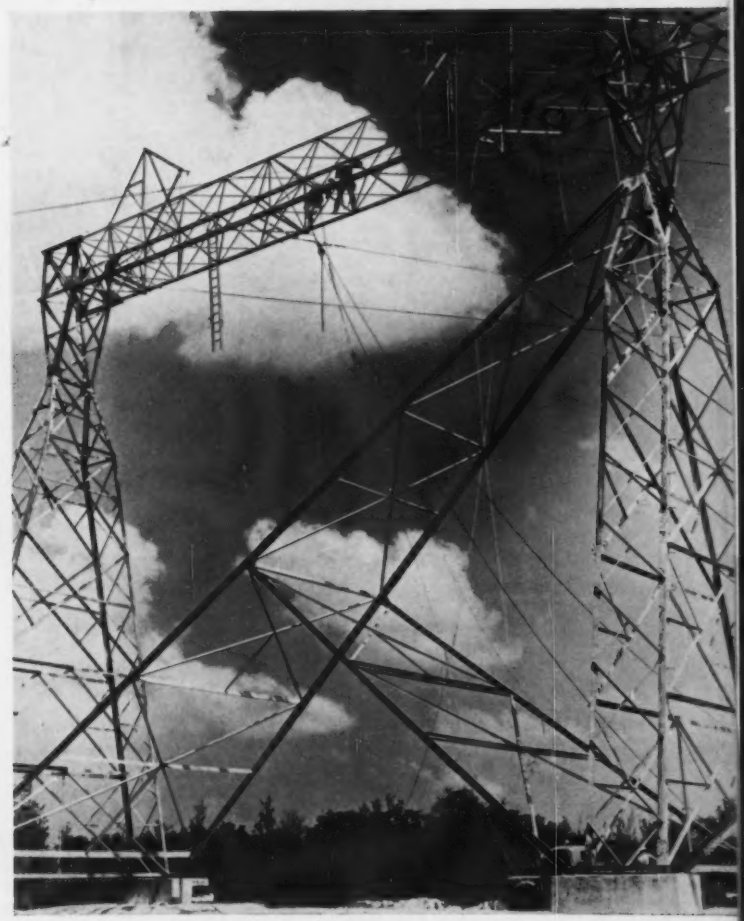

230-Kv Line Designed for *Hurricanes*

. . . page 56

30 Co-ops Buy 2% US Bonds—p44

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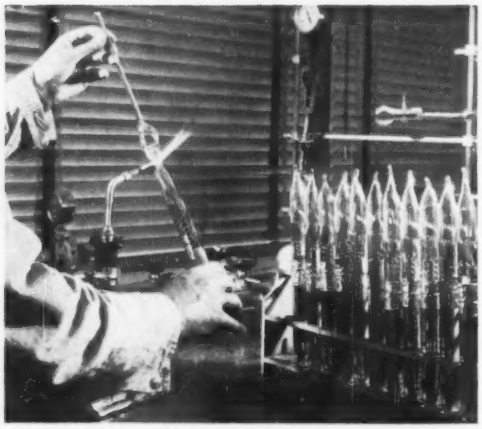
General Electric's Permalex* Insulation Takes the Steam Out of an Old Problem in Transformer Design



ACCELERATED AGING of scaled-down hermetically sealed insulation systems (above) in ovens (below) gives scientists in G.E.'s Insulation Lab important data on thermal resistance and compatibility of materials.

GENERAL ELECTRIC'S PERMALEX INSULATION SYSTEM is one of the most significant developments in the last 25 years. Quite literally, it takes the steam out of the old problem of thermal degradation of insulation systems in distribution, network, and medium transformers.

WATER, formed under higher operating temperatures, causes deterioration of all insulation components. The weakest link, therefore, until the development of Permalex insulation, was kraft paper, whose cellulose structure includes water-forming hydroxyl groups.

TO MARKEDLY REDUCE WATER FORMATION, scientists in General Electric's Insulation Materials Laboratory, after evaluating many alternatives, hit upon cyanoethylation of paper pulp as the best solution. In this process, cyanoethyl groups replace the most weakly held hydroxyl groups on the cellulose molecule, altering its chemical structure. Hydroxyl groups which are not replaced have their chemical bonds strengthened.

BENEFITS of this important development are either greater transformer loadability or longer transformer life. This is true because:

- Thermal resistance of kraft paper insulation is increased at least 20% in the range of 150 to 175C.
- The dielectric life of even the best enameled wire, such as Formex* wire, is also increased.
- The life of the transformer oil is increased.
- Cyanoethylation is a *chemical* reaction with the kraft pulp; it is not an additive or scavenging process with materials that can be dissolved out to contaminate the oil or induce corrosion of metal.
- Cyanoethylated kraft paper is completely compatible with all other materials used in General Electric transformers.

A 20 PERCENT THERMAL uprating of transformers originally announced by General Electric scientists in 1959 now appears to be quite conservative after a year's experience with Permalex insulation. The direct and quantitative relation of thermal improvements to higher transformer loadability is of great fundamental importance to the industry and may well foreshadow a revision of industry standards. Meanwhile, you may profitably utilize the higher kva 55°/65° ratings appearing on all General Electric oil-filled distribution and network transformers.

SAVINGS that you can realize with General Electric distribution, network, and medium transformers can be spelled out for you by your General Electric Sales Engineer. Call him today. General Electric Company, Schenectady 5, N. Y

604-07

*Trademark of General Electric Co.

GENERAL ELECTRIC

Electrical World

Vol. 154, No. 8 AUGUST 22, 1960

Published for 86 years for those engaged in the business of generating, transmitting, distributing, or applying electrical power

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Chance EPOXIGLAS® Hot Sticks

Thorough tests in the Weather-Ometer show that Epoxiglas is moisture-proof. Sticks exposed to extensive sunlight and 100% humidity show no deterioration or moisture absorption.

Proved Totally Moisture-Proof

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LETTERS

Meanwhile, Back at the Utility Pole . . .

The one-man campaign to keep political posters off utility poles continues. We wrote in an editorial last year (Feb. 16, 1959, p 61) about Charles H. Russell's efforts to remove the hazards of pole climbing by keeping nails, tacks, and splinters off the poles. We are glad to see from his latest correspondence that he is getting primed for this year's elections:

To the Editor:

Wish me luck. Lend a hand. I have asked both Vice President Nixon and Sen Kennedy to make public announcements—No political posters on utility poles.

Lend your hand to this.

Charles H. Russell
Arlington, Va.

Writing the Kilowhachacallit

To the Editor:

It is unfortunate that after about three-quarters of a century, there is still no uniformity on the method of writing the fundamental unit of our industry, the kilowatthour (some people use a hyphen) and its abbreviation.

"Kwhr," a logical combination of "kw" (for kilowatt) and "hr" (for hour), is used by many sources, such as the American Standards Assn (Z10.1-1941), EEI, AIEE, and *Electrical World*.

On the other hand, the FPC, many electric utilities, and other sources use "kwh" or "KWH" (sometimes with periods).

How about starting a campaign to make "kilowatthour," and its most sensible abbreviation, "kwhr," the people's choice?

A. P. Vierheller
Union Electric Co
St. Louis 1, Mo.

▶ *We would be pleased to see "kwhr" used universally. Wherever possible, it's our policy to use abbreviations accepted by the ASA and AIEE, and we believe others should do the same.*

Ode to a Kilowatt

To the Editor:

As an electric utility employee and a writer of sorts of light verse, I (have devised) two safety verses with a slant toward the electric utility:

DON'T GIVE THEM A BUM STEER
Drive with care!
Those little tots
May some day buy
Our kilowatts.

ON THE BRIGHT SIDE
Illuminate to be well read,
Burn, but do not smoke in bed.

(Miss) Lee Foehr
St. Louis, Mo.

#1 RECTIFIER FAILURE
EVAPORATOR FEED TANK OVERFLOW
RECYCLE BRINE TANK OVERFLOW
440 V. POWER FAILURE
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NO OTHER ANNUNCIATOR OFFERS YOU ALL THESE FEATURES:

Operation: 1. Operational sequences may be changed without altering terminals, connectors or jumpers, even while power is on. 2. Operation from normally-open or normally-closed circuit contacts may be easily changed after installation by merely plugging in the designated relay unit. 3. No power drain—no "dropping resistors" to burn out or cause internal heating. 4. Wide selection of operational sequences. 5. Simple specific purpose "plug-in" circuits. 6. Indicating circuit provides extra contacts and independent terminals for data logging or other control functions. 7. Test for all indicating lamps on annunciator as standard equipment. **Design:** 1. Complete modular construction for flexibility of application. 2. One-piece molded lamp compartment and indicating plates snap into position. 3. Long-life under-voltage, double contact bayonet lamps will not loosen. 4. Relamping from front without opening door. 5. Lamps in multiple, no signal loss in burnout. 6. Dust resistant, continuous gasket front and back. 7. No exposed live parts. 8. Circuits plug in—vibration-proof lock. 9. No mounting holes required for panel mounting types. 10. Long-life relays—high temperature insulation, diffused gold contacts of higher rating, nylon coil, sealed windings. 11. Hermetically-sealed relays available when specified. 12. Heavy-duty barrier-type terminals accommodates through No. 10 AWG wire.

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SPECIALISTS IN SIGNALING SINCE 1872/FOR CONTROL • COMMUNICATION • PROTECTION/(IN CANADA: EDWARDS OF CANADA, LTD., OWEN SOUND, ONT.)

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Start with a local call . . . Why not consult with your Graybar salesman and discuss a specific plan based on your system needs?

Employee-owned Graybar, a part of your local community, has served utilities continuously since the first lines went up. Whether you require 3 items or 3,000, Graybar is your most practical source for most electrical utility equipment and supplies.

When Graybar is your auxiliary warehouse—	You save on storeroom costs Reduce inventory investment Insure prompt delivery Step up man-hour efficiency Simplify bookkeeping

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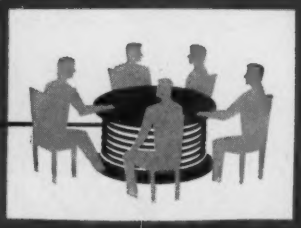
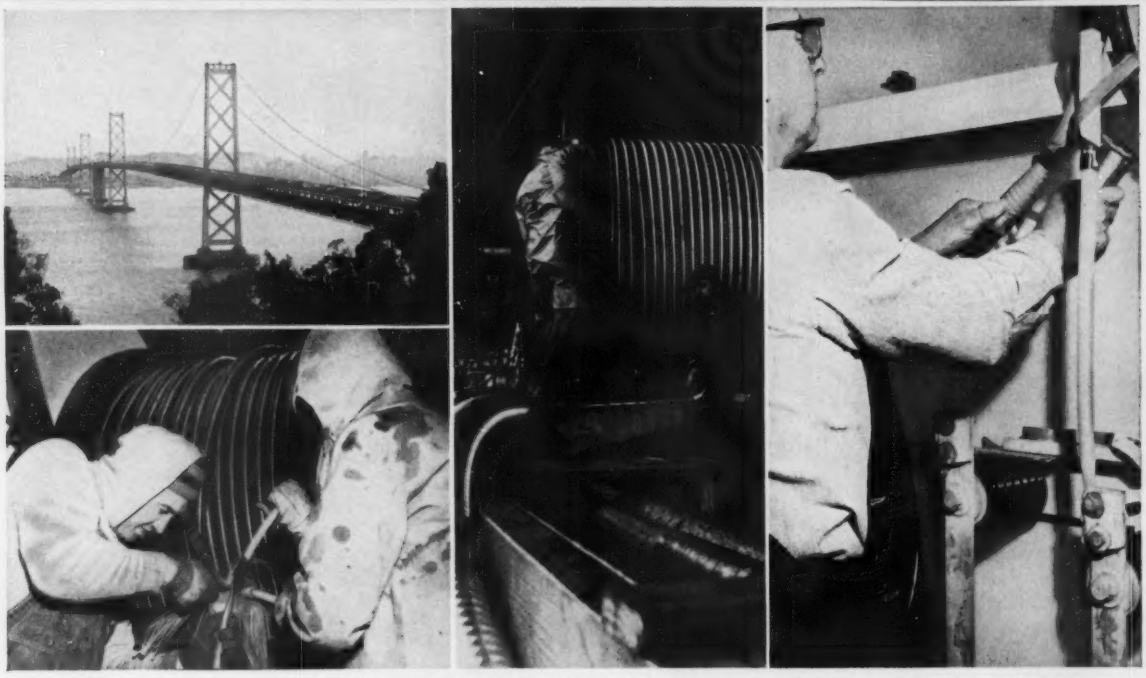
WIRE AND CABLE ROUND TABLE





Workmen install new 15KV cable insulated with ALATHON. The basic rewiring of the famous bridge involves the installation of two new primary circuits, which will conduct power to the two new roadway lighting systems.

General Electric 15KV power cable insulated with ALATHON® being installed at San Francisco Bay Bridge

A four-year reconstruction job, designed to increase traffic capacity by 25-35%, is under way at the famous San Francisco Bay Bridge. An important part in the renovation is the extensive rewiring of the roadway lighting system. To obtain maximum performance at minimum cost, engineers selected 11,000 feet of General Electric 15KV power cable insulated with Du Pont ALATHON polyethylene resin for the job.

The G-E cable utilizes the extremely low power factor and dielectric constant (2.28) of ALATHON. This assures a low dielectric loss and gives the cable a greater load-carrying capacity. And through extensive research, Du Pont has developed a corona-resistant ALATHON to insure even greater long-term reliability. Because of its superior electrical properties, the insulation of ALATHON can be thinner than other materials, making the cable lighter in weight. Thus shipping, handling and installation are easier and more economical.

Investigate how ALATHON and the other Du Pont plastics can help solve your wire and cable problems. Contact your wire and cable supplier or write: E. I. du Pont de Nemours & Co. (Inc.), Dept. M-822, Rm. 2507A, Nemours Bldg., Wilmington 98, Del. *In Canada:* Du Pont of Canada Limited, P.O. Box 660, Montreal, Quebec.

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Core and coil cut vault requirements per kva. Effective coil bracing assures high short-circuit strength.
NO HIDDEN SURFACES
Corrugated tank-cooling surface eliminates all dirt-catching, hard-to-clean corners and crevices. Simplifies painting.
LOW NOISE LEVEL
A-C core design — a result of long experience with all electromagnetic, mechanical factors and testing — minimizes noise.
LOW EXCITING CURRENT
A-C cores of nonaging grain-oriented silicon steel have lower core-grain flux, exciting current.
WOUND
Continuous high-voltage winding has no joints. Solid insulation barrier between low-voltage windings and core.

Network news! smaller, vault-saving size

Smaller, lighter, more efficient — these advances mark the latest Allis-Chalmers network transformer developments. They're reliable, compact powerhouses — whisper-quiet performers.

And how they save you money! Reduced dimensions make them easier to handle, easier to lower into smaller, economy vaults. Your labor, equipment rental and operating costs nosedive.

Consider this, too! A new A-C network in an existing vault "opens up" previously tight quarters, eases routine inspections. Welded main cover ends gasket maintenance . . . bushings are easily replaced from outside in event of damage.

• • •

Whether you're thinking about a new or replacement network transformer, see your nearby A-C office and save money. Or write **Allis-Chalmers,** *Power Equipment Division, Milwaukee 1, Wisconsin.* A-1317

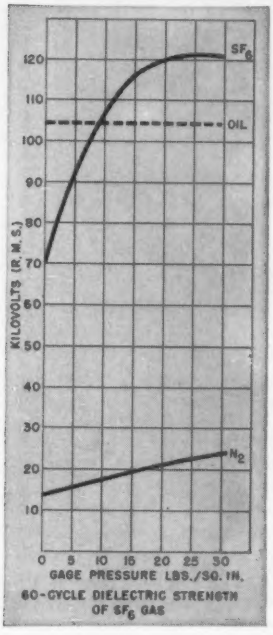
(Advertisement)

ONE OF A SERIES . . .

Improved safety to system, personnel and equipment provided in new SF_6 gas breaker

. . . improved performance from 69 to 460 kv and beyond

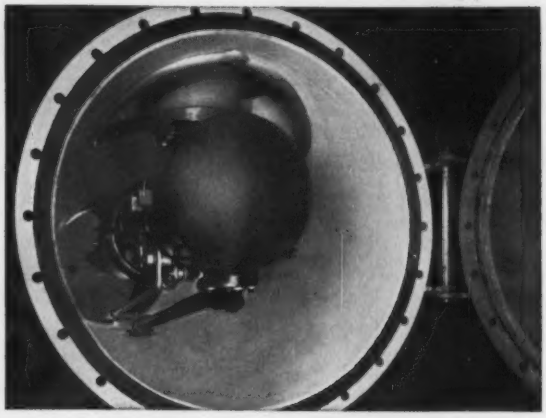
The unusual characteristics of the new arc extinguishing medium, SF_6 (sulfur-hexafluoride) gas, have made possible a power circuit breaker of unequaled safety. For example, a single operating mechanism mechanically connected so that all contacts open and close simultaneously insures reliable relay operation. Additional benefits are found in its dead-tank construction, low, accessible design and an advanced interrupting technique.



Most important for breaker applications is the arc-quenching ability of SF_6. The gas is able to change the arc path from a good conductor to an excellent insulator in a few microseconds following current zero. This remarkable electronegativity characteristic makes SF_6 an ideal interrupting medium.

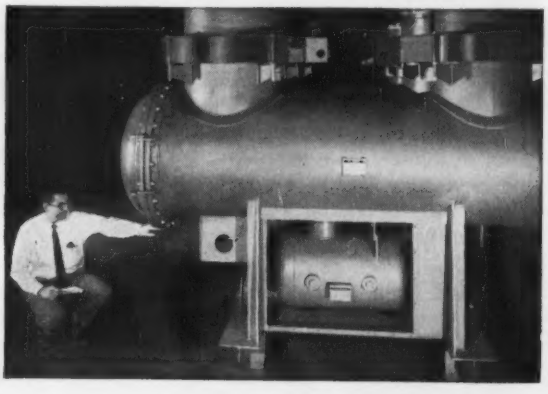
During arcing, a negligible quantity of SF_6 is decomposed. After the arc is extinguished, however, practically all of these decomposition products recombine to form SF_6. The minute remaining gaseous arc products are effectively removed by filters of activated alumina.

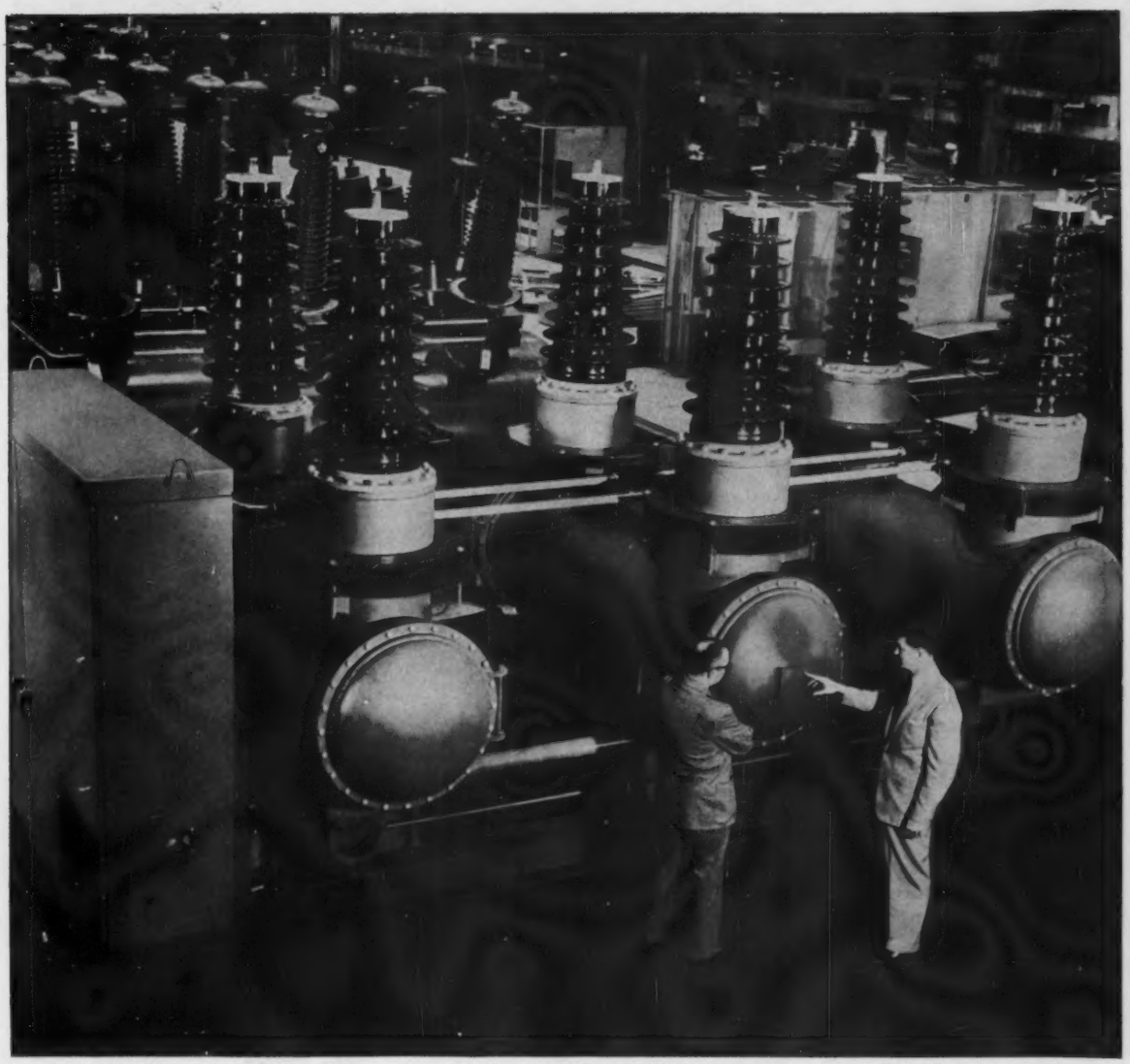
The high dielectric strength of SF_6 at relatively low pressure makes practical a dead-tank design of minimum size and weight. Dead-tank construction



permits operating personnel to work near the energized breaker in complete safety.

Clearances in the compact 230-kv tank were tested at the High Voltage Lab . . . found more than adequate to withstand 60-cycle test voltage of 425 kv and BIL test voltage of 900 kv at normal pressure . . . and still withstand *twice* line-to-ground system voltage at *zero* gauge pressure.

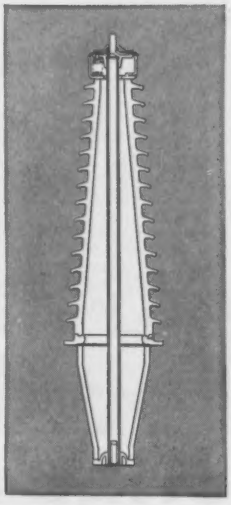




Inert SF_6 is both nonflammable and nontoxic, providing a breaker with the inherent safety needed in all installations.

Use of a horizontal interrupter in the Westinghouse breaker provides another important personnel safety factor. The interrupter is readily accessible at ground level . . . no ladders or scaffolding is needed to make inspections.

In the Westinghouse breaker, current transformers are provided on both sides of each pole. This design makes possible overlapping relay protection. Also, provision is made for mounting two CT's around each bushing. Being externally mounted, they are easily installed.



For the first time in more than half a century, Westinghouse has deviated from its proved condenser bushing design to provide another forward step in the new SF_6 gas breaker. The drawing at left shows the hollow bushing which is open to the main breaker tank and filled with SF_6 gas, a self-healing dielectric. There is no organic insulation to break down. There is no porcelain under high pressure as an added safety factor.

To learn more about the increased breaker life, reduced maintenance and lower installation cost of the SF_6 gas breaker, call your Westinghouse sales engineer. Or, write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. J-61004

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NOW Save costly man-hours, reduce downtime with the new E-M Straight-Up-Ventilated Boiler Feed Pump Motor. It gives you . . .

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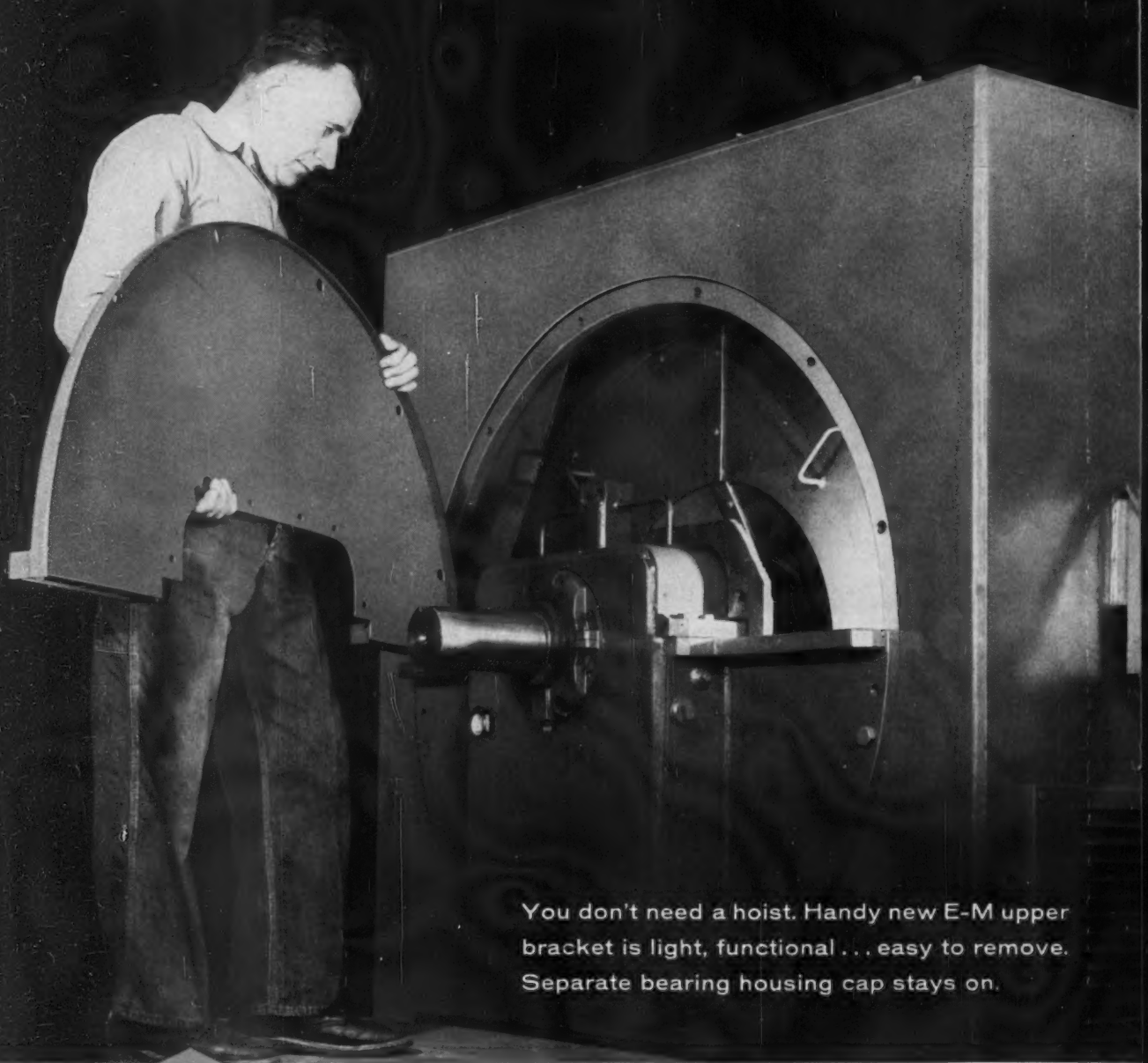

You don't need a hoist. Handy new E-M upper bracket is light, functional . . . easy to remove. Separate bearing housing cap stays on.

E-M

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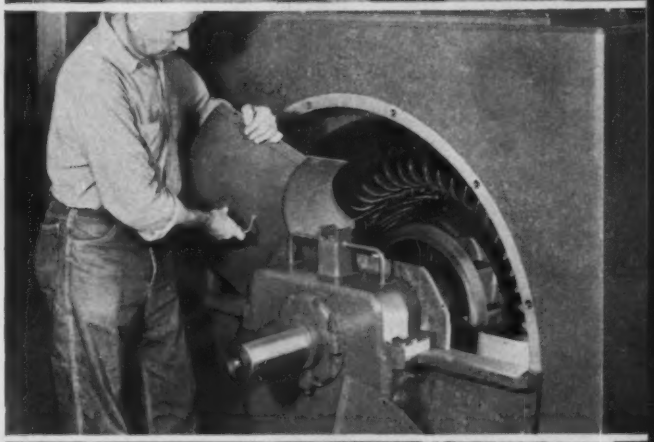
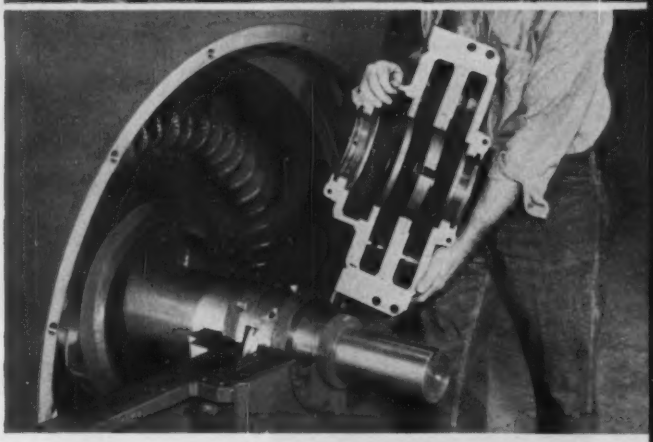
Builders of the new pump motor

It's easy to remove louvers —just unbolt, lift off. Access plates let you clean thoroughly behind stator core.

Coils are readily checked for condition and cleanliness. Four-section air baffle comes out easily without taking off lower bearing bracket.



Just lift the cap to inspect bearings. Raise the rotor shaft to roll out the lower bearing half.



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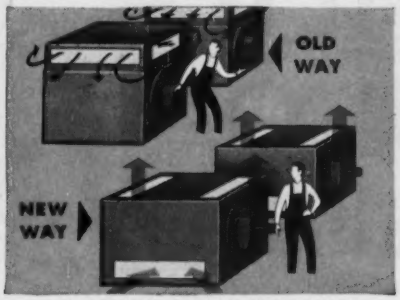

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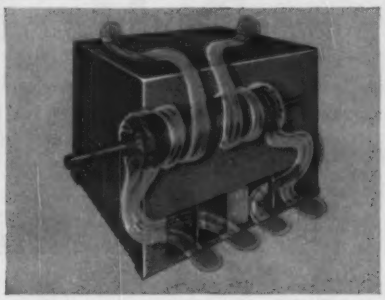

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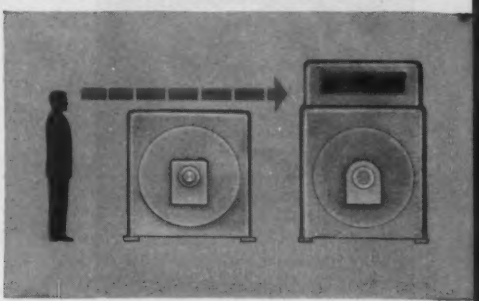

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MFG. COMPANY MINNEAPOLIS 13, MINNESOTA

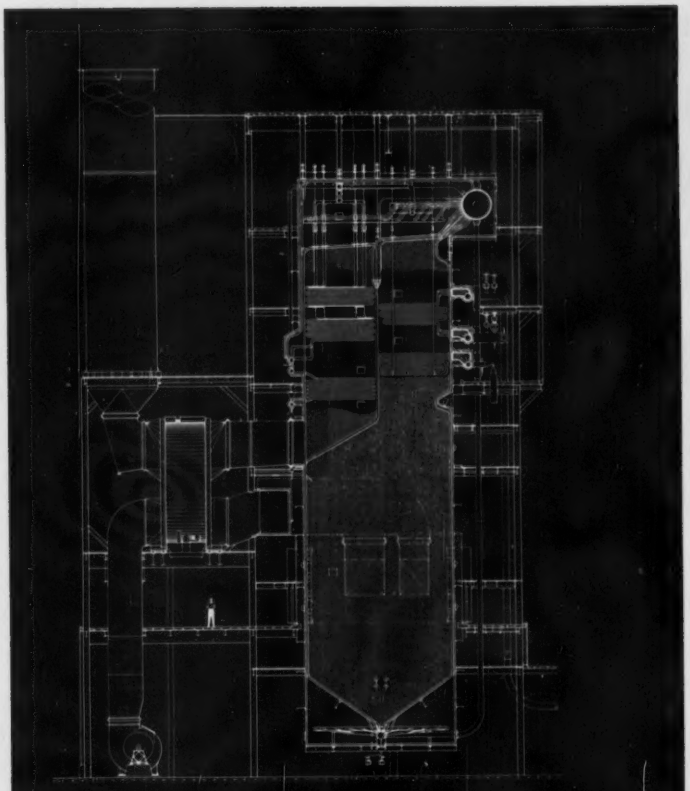
that performs as well on the job as on the test stand

NEW UTILITY STATIONS, C-E EQUIPPED

Includes only new stations on *new* sites placed in operation since JANUARY 1, 1950.

LAKE CATHERINE
HUTCHISON
YATES
DUNKIRK
TITUS
LEE
CONTRA COSTA
HAWTHORN
NINEMILE POINT
EDGE MOOR
PALATKA
JOHNSONVILLE
DANSKAMMER
BECKJORD
HIGHGROVE
PLANT X
BLACK DOG
ALBANY
JOPPA
MERAMEC
PORTSMOUTH
LAKE CREEK
ETIWANDA
AURORA
HENNEPIN
EASTLAKE
OAK CREEK
SUWANNEE RIVER
URQUHART
KINGSTON
SANDOW
MULLERGREN
BARRY
NORTH OMAHA
WILMINGTON
CARBON
SAGUARO
MORRO BAY
VERMILION
JOHN SEVIER
COLLIN
MILLIKEN
GALLATIN
BARRETT
MITCHELL
SAN BERNARDINO
YORKTOWN
GULF COAST
TUCSON
PORT WENTWORTH
W. A. PARISH
ALLEN
MONTROSE
McMEEKIN
LEWIS and CLARK
ROY S. NELSON
YUMA AXIS
DICKERSON
DAN E. KARN
WILLOW GLEN
OCOTILLO
DARLINGTON COUNTY
PORT EVERGLADES

NICHOLS



This C-E Steam Generating Unit is now in service at Nichols Station of the Southwestern Public Service Company, and a duplicate is scheduled for operation at a later date. These are radiant, reheat boilers arranged for pressurized firing. The reheater section is located above the finishing superheater in the first pass directly above the furnace. An economizer section is located below the primary superheater surface in the rear pass, and a regenerative air heater follows the economizer section. Each unit is designed to produce 800,000 lb steam per hr at a throttle pressure of 1400 psi and a temperature of 1000 F, reheated to 1000 F. Primary fuel is natural gas (which is available from four separate sources) fired through C-E Tilting, Tangential Burners.

NEW NICHOLS STATION

Goes into Service

ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT;

Southwestern Public Service Company recently placed in service Unit No. 1 of its new Nichols Station. This is the first of two units, each rated at 112,500 kilowatts. Unit No. 2 is scheduled for completion in mid-1962. The plant was named in honor of H. L. Nichols, Chairman of the Board since 1942. It was designed, engineered and construction was supervised by Southwestern's own engineering department.

Located northeast of Amarillo, Texas, the new station brings Southwestern's system capability to 925,800 kilowatts. Unit No. 2 will boost capability over a million kilowatts. The station uses reclaimed water from the treatment facilities of the City of Amarillo.

Steam for Nichols Station's No. 1 turbine-generator, and for the second unit in construction, is supplied by C-E Steam Generating Units of the radiant, reheat design. Cross-sectional elevation and brief description appear on the opposite page.

COMBUSTION C·E **ENGINEERING**

C-291

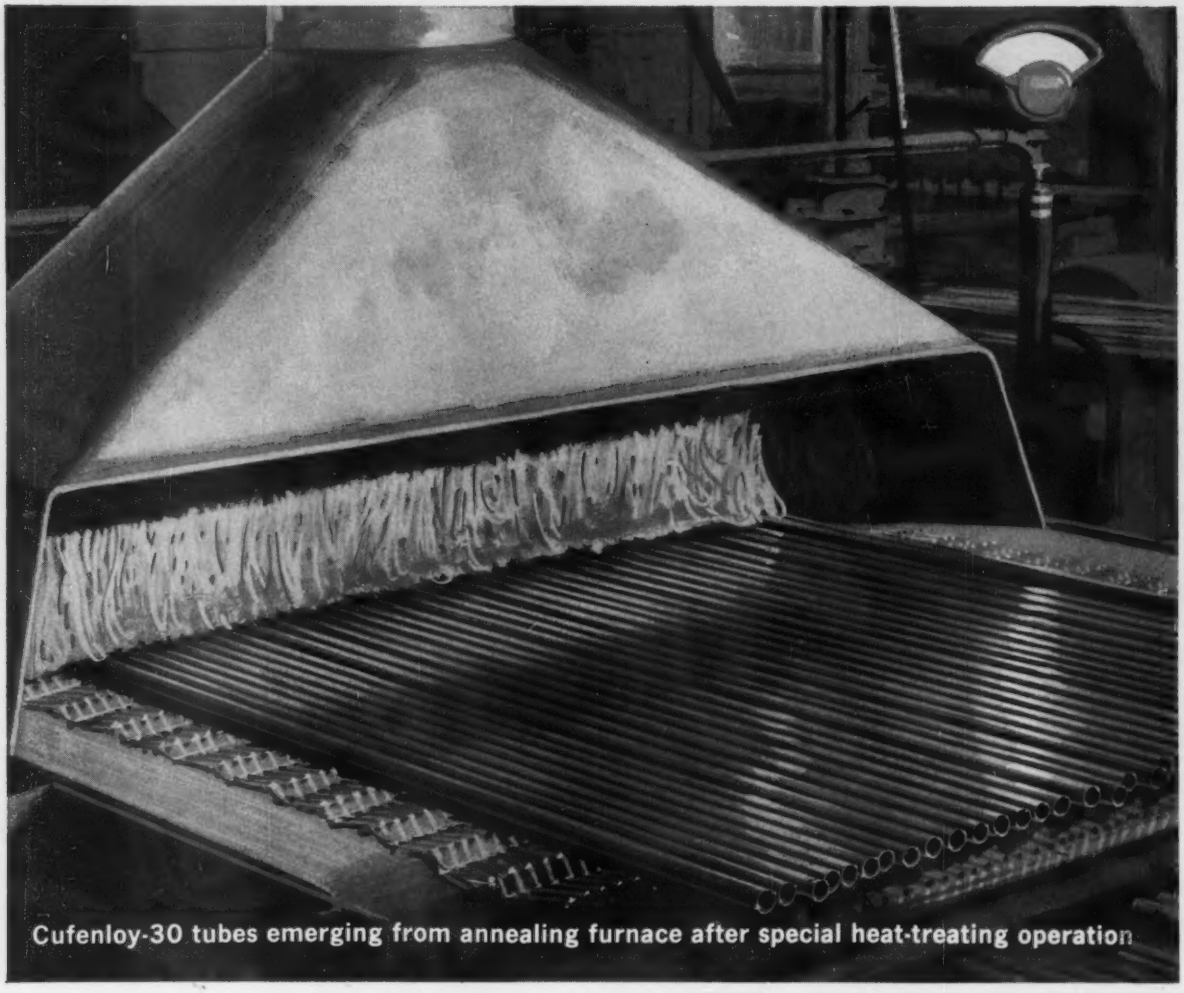
General offices: Windsor, Conn. • New York offices: 200 Madison Avenue, New York 16

NUCLEAR REACTORS; PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; SOIL PIPE

DEVELOPED BY PHELPS DODGE

CUFENLOY-30...DRAWN, STRESS-RELIEVED CONDENSER TUBES THAT OFFER IMPROVED PROPERTIES...CUT BUNDLE COSTS!

Approved under ASME Code for unfired pressure vessels



Cufenloy-30 tubes emerging from annealing furnace after special heat-treating operation

New, high strength Phelps Dodge Cufenloy-30 condenser and heat exchanger tubes are the result of years of intensive Phelps Dodge research devoted to improving the properties of copper base alloys.

Cufenloy-30 (copper-nickel alloy containing nominally 70% copper and 30% nickel) properties offer OEM and re-tubing users these important advantages:

1. Increased tensile and yield strength for up-to-800°F. metal temperature.

2. Thinner tube walls, when substituted for annealed cupro-nickel 30%, that reduce total tube bundle weight as much as 15% with consequent lowering of cost per bundle.

3. Cost reduction up to 50% per bundle without any sacrifice of safety when substituted for the annealed 65/35 nickel-copper alloy.

Cufenloy-30 tubes are fabricated by a special Phelps Dodge-developed drawing and heat-treating process that is unique in the industry. Test data on this improved tube was thoroughly evaluated by an independent research institute and final results submitted to The American Society of Mechanical Engineers. Under case num-

Comparison of minimum wall thickness of ⅝" O. D. tubes of various alloys when made to ASME code requirements.

Alloy	ASME Allowable Stress Values, psi At Design Temperatures 450°F	600°F	Design Pressures, psi	Minimum Wall Thickness (inches) to comply with Allowable Stress Values ⅝" O. D. Tube at 450°F	at 600°F
70/30 Copper-Nickel (Annealed)	10,100	9,600	2,000 3,000 4,000	.0574 .0829 .1070	.0600 .0868 .112
Cufenloy-30 Drawn, Stress-Relieved	15,400	14,600	2,000 3,000 4,000	.0386 .0565 .0735	.0408 .0593 .0772
65/35 Nickel-Copper (Annealed)	14,750	14,700	2,000 3,000 4,000	.0400 .0586 .0762	.0404 .0590 .0767

ber 1266 the ASME Boiler and Pressure Vessel Committee unanimously approved Cufenloy-30 tubes for use in ASME unfired pressure vessel code applications. Also the ASTM B-5 Committee has included the Cufenloy-30 alloy in the B-111 specification for copper alloy condenser tube.

Cufenloy-30 tubes, in drawn, stress-relieved condition, are available in all standard condenser and heat exchanger sizes, in famous Phelps Dodge uniform bore Dual Gauge and in "U" bend tubes. For further information, contact your local Phelps Dodge sales office or write Dept. EW-1 for the Cufenloy-30 technical brochure.

PHELPS DODGE COPPER PRODUCTS
CORPORATION
300 Park Avenue, New York 22, N. Y.

PD

BEACON COALS FOR ELECTRIC UTILITIES,
Industrial and Commercial Uses

Here are some facts that may interest you — as a buyer of coal for power plant use — when you are seeking a dependable source of supply.

Our yearly productive capacity is in excess of 10,000,000 tons. We can meet tonnage requirements of the largest user, and adhere to the strictest time-table on shipments.

We produce, in our fifteen active mines, a variety of coals with a complete range of analyses. We can thus satisfy the most exacting specifications . . . and furnish the fuel best suited to your particular combustion equipment.

We maintain a central coal laboratory, supplemented by quality control labs at each of our larger mines. This assures conformity to standards.

Our representatives are trained combustion men, who can understand your needs, and work intelligently to meet them. Inquiries and follow-ups are expedited by our teletype network, which connects sales offices with all our major mines.

Doesn't it seem reasonable to think that our *product* plus our *service* can bring you something extra in filling your fuel needs? We'd like to demonstrate that it can.

EASTERN GAS AND FUEL ASSOCIATES
BEACON COAL

EASTERN GAS AND FUEL ASSOCIATES

Pittsburgh • Boston • Cleveland • Detroit • New York
Norfolk • Philadelphia • Syracuse

For New England: NEW ENGLAND COAL & COKE CO.

For Export: CASTNER, CURRAN & BULLITT, INC.

The Electrical Week

LATE NEWS

County Court refuses to delay condemnation action on Princeton, Ky properties of Kentucky Utilities until higher court can rule on validity of last fall's election okaying municipal system. . . . Union Electric Co and Local 148 of Operating Engineers Union agree on new contract. Negotiations with IBEW locals representing clerical and outside workers continue.

Longest rate case in N. J. PUC history gives Public Service E&G $10,163,000 of $36,400,000 requested annual increase in electric and gas rates. Grant includes $3,500,000 temporary gas boost given in Jan. '59. PUC considers 6.25% is fair return, asks utility to file new rate breakdown by Sept. 2.

Filing of direct testimony on Nez Perce and High Mountain Sheep Dams is postponed until Sept. 2. . . . PRDC asks US Supreme Court to review and reverse Court of Appeals June 10 decision setting aside construction permit for Enrico Fermi. Stay on lower court order has permitted construction to continue.

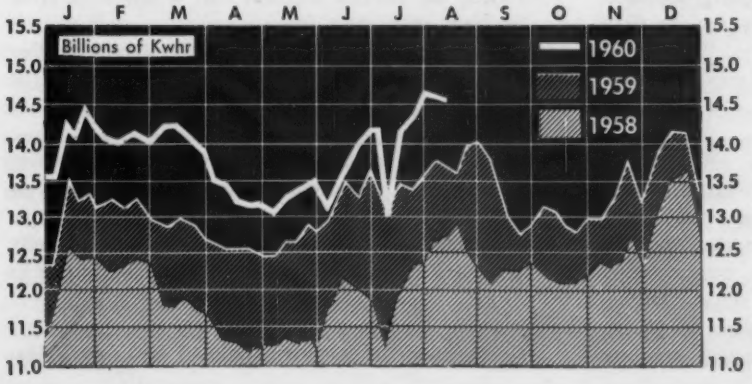
Average residential use in TVA area hit 8,606 kwhr in 12 months ending June 30. Average residential rate in area was "just under" one cent, TVA's all-time low. . . . First simultaneous demand over 5 million kw is claimed by PG&E. System hit 5,126,000 kw at 1:30, July 21, after three days of slightly lower peaks.

"Where do we go from here," was theme of meeting of five federal inter-agency river basin committees in Boulder, Colo., Aug. 19. The five committees, meeting for the first time, are: Missouri Basin, Columbia Basin, Pacific-Southwest, New York-New England, and Arkansas-White-Red River coordinating groups. Asst Secy of Interior F. Aandahl told the groups that national interests must have priority over regional views.

Georgia Power buys Rabun Land & Water in northeastern Georgia for $212,000. Rabun has 400 customers and a 240-kw plant. . . . Shawinigan Water & Power transfers 5,800 customers to Hydro-Quebec as Quebec provincial government approves sale of some local distribution systems. Transfer includes about 1% of total customers of Shawinigan and its subsidiaries.

Pentagon sets up Project Lorraine to put Defense Dept research on energy conversion in one organization. Project will include basic research on direct conversion of heat to electricity. Studies by Pentagon and Rand Corp will determine extent of consolidation.

WEEKLY POWER OUTPUT—Up 7.1% (Week Ending August 13), Kwhr 14,622,000,000



Per Cent Change From Previous Year

	July 30	Aug. 6	Aug. 13
Total U. S.	+ 7.1	+ 7.6	+ 7.1
New Eng.	+ 3.7	+ 7.2	+ 4.1
Mid. Atlan.	+ 1.9	+ 1.2	+ 5.0
Cent. Ind.	+ 7.2	+ 7.8	+ 6.5
West Cent.	+ 8.2	+ 3.7	+ 8.9
Southeast	+ 4.7	+ 6.4	+ 7.2
South Cent.	+18.8	+ 6.3	+ 9.3
Rocky Mount	+ 7.2	+11.8	+11.8
Pacific			
NW	+ 4.9	+ 5.2	+ 4.5
SW	+ 9.9	+ 7.7	+ 9.3

Seasonally Adjusted Index 267.9

Week Ago 268.8 Year Ago 251.8

Source: Edison Electric Institute

Preview of This Issue

EVENTS ▶ Co-op investment in new 2% US Treasury bonds is growing. A look at the first 30 investors shows which co-ops are prospects **(p 44)** . . . Political climate in Oregon is stormy for investor-owned utilities **(p 46)** . . . PASNY 345-kv line to connect Niagara and St. Lawrence projects hits right-of-way snag **(p 47)** . . . Federal Pacific and I-T-E Circuit Breaker enter guilty pleas in anti-trust suit **(p 48)** . . . FPC rules out ECAP deductions **(p 45).**

ENGINEERING ▶ **Automatic centralized control of federal generating plants** on the Columbia River will be started next year by BPA. Consoles in dispatching center will control five plants, but load division among plants will still be preset manually **(p 50).**

Where do boiler feed-pumps turbines stand today? Most units are tailored to the overall plant cycle, while full-capacity feed pumps are favored for plants up to 350 Mw **(p 52)** . . . New-customer-job procedures at San Diego G&E reduces processing time, eliminates most costly "rush job" problems on minor orders, and improves customer relations **(p 54).**

Battering 150-mph hurricane winds are like a breeze to Florida P&L's 230-kv transmission line. Tying Port Everglades into the utility's system, the 7½-mile line is already operating at 138 kv **(p 56).**

PROCUREMENT & PRODUCTS ▶ 1960 labor contract negotiations move into high gear at Westinghouse and GE . . . More companies announce 5% insulator price increase **(p 74).**

Politics and Public Power

USBR POLICY LIMITS FIRST TIME BIDDERS

The Bureau of Reclamation has on its books a policy—little mentioned—which produced an unusual series of awards for hydro turbines on its projects. The awards went to two foreign and two domestic suppliers, calling for nine turbines to be installed at four federal power sites: Flaming Gorge, Trinity, Clear Creek and Keswick-Spring Creek.

The policy, in effect, requires that the Bureau award only one contract to any company which is supplying a large piece of machinery for the first time. The policy, in other words, says: "Don't put all your eggs in one basket"—unless you know the basket.

The policy, according to Bureau officials, has nothing to do with national defense considerations, and is limited entirely to "good business practices." It applies to major, complicated pieces of machinery, such as hydro turbines, generators, transformers. And it further limits a company to a single contract when that firm is supplying a new piece of major equipment for the first time, even though the firm has previously supplied other equipment.

Assistant Reclamation Commissioner N. B. Bennett Jr says, "It wouldn't be in the best interests of the government" to give all four of the turbine contracts to first-time bidders until they demonstrate their equipment's ability to perform under Bureau standards.

The policy, however, also has the strong flavor of attempting to block foreign bidders. Usually the policy has been applied against foreign bidders. Again, the Bureau explains that it has done little business with most foreign concerns, and doesn't know their equipment. On the other hand, the Bureau has dealt many times with the handful of domestic suppliers of turbines and generators.

The policy is not new for the Interior Department. In 1952, the Bonneville Power Administration invoked it to limit American Elin (Austria) to a single contract for large transformers, and subsequently limited English Electric Co to a single contract in 1953.

However, the issue was pointed up in the early-

Manufacturers News: Indicators to measure effectiveness of transmission line shielding are used in lightning flashover studies conducted by AEP in Ohio. Five hundred units were designed by GE . . . Mobile 60-Mw transformer enables US Steel to operate at or near full capacity should power systems of any of its plants fail **(p 76).**

New Equipment: Pad-mounted transformer is designed for heavy low-voltage load concentration, as in shopping centers and hotels . . . Switch-fuse unit serves as a bypass for oil circuit by reclosers when installed in conjunction with a conventional disconnect **(p 91).**

MANAGEMENT ▶ **Want more facts on electric heating economics?** Then check this study that five NELPA companies made last winter. They charted demand and kwhr use in 50 electrically heated homes. For a wealth of encouraging detail they turned up on load factors, demands, and heating's effect on system peak, turn to **page 83.**

SELLING ▶ **An increase of 2.3 million kwhr per year is racked up** by Atlantic City Electric in a six-week refrigerator-freezer promotion. Recorded sales of 2,300 amounted to 383% of the utility's original quota **(p 94).**

NEXT WEEK ▶ **Colorful, informative**—that's EW's Electric Utility Methods special report.

August awards (totaling $3,421,240) for nine turbines at four federal dams. In each case, a foreign firm was low bidder—Hitachi New York, Ltd, (Japanese) in three; English Electric in one—and in addition, English Electric was second lowest to Hitachi in two cases.

A standard 6% price differential in favor of domestic firms, under Buy American provisions, had no effect, since all foreign bids were considerably lower.

However, under the Bureau's policy, Hitachi and English Electric were entitled to only one contract each. The Bureau previously had bought transformers from English Electric (no turbines), and no major equipment from Hitachi. In fact, this was the first time any Japanese firm successfully bid for a Bureau turbine contract.

Reclamation officials had an option, under their policy, as to which foreign bids to reject. This decision was based on which combination of low bids would cost the government the least money. The Bureau took into consideration the second and third lowest bids, and did not necessarily give Hitachi the lowest of its three low bids. The result of the figuring was:

(1) Hitachi won a $664,860 contract to supply two 93,500-hp turbines for Clear Creek power plant near Redding, Calif. English Electric was second with $762,000; Baldwin-Lima-Hamilton was third with $975,000. Four others were higher.

(2) English Electric won a single $832,830 contract to supply two 85,000-hp turbines for Trinity Dam, Calif. Baldwin-Lima-Hamilton was second at $1,065,000, and two other domestic firms were still higher.

(3) James Leffel & Co, Springfield, Ohio, won a $798,550 contract to supply three 50,000-hp turbines for Flaming Gorge Dam, Utah, after Hitachi's low bid ($595,792) was disqualified.

(4) Newport News Shipbuilding & Drydock Co won a $1,125,000 contract to supply two 105,000-hp turbines for Spring Creek power plant at Keswick Dam, Calif. Newport News' bid was third lowest, but the award was made after both Hitachi's low bid ($722,450) and English Electric's second low bid ($925,000) were disallowed.

Nuclear Notes

Enrico Fermi plant builder, Power Reactor Development Co, has shown that several other atomic plants have more striking proximities to population centers than does the PRDC plant. Among them are three-year-old Shippingport, which has 125,000 people within a ten-mile radius and is 30 miles from midtown Pittsburgh, and Pathfinder, 5½ miles from Sioux Falls with 60,000 population.

Requirement for a 2,000-ft exclusion radius has been stuck to by the Advisory Committee on Reactor Safeguards in its recommendations to its parent organization, the AEC, on the reactor sites proposed by the city of Jamestown, N. Y., and by Dairyland Power Cooperative of Wis. Jamestown seems to be having trouble finding enough land, but the co-op has alternate sites it thinks will be satisfactory. Both have submitted proposals to the AEC on this second-round demonstration nuclear plant, which will be designed to produce 16.5 kw in a pressurized-water reactor and boost that to 22 Mw in a fossil-fueled superheater.

Nuclear power cheaper than that from existing diesel-fueled generators should come from a pressurized-water plant at McMurdo Sound in the Antarctic. The AEC has accepted a proposal from the Martin Co to supply the packaged 1,500-kw power plant for not more than $3,950,678. Diesel oil, much of it flown in, costs $1 to $3 per gal for the present electric generators. The new unit will be cooled and moderated by light water. Radioactive wastes will be disposed of in accordance with the Antarctic Treaty just ratified by the Senate. McMurdo Sound, a naval facility, is the principal base of operations for all US scientific efforts in the southernmost continent.

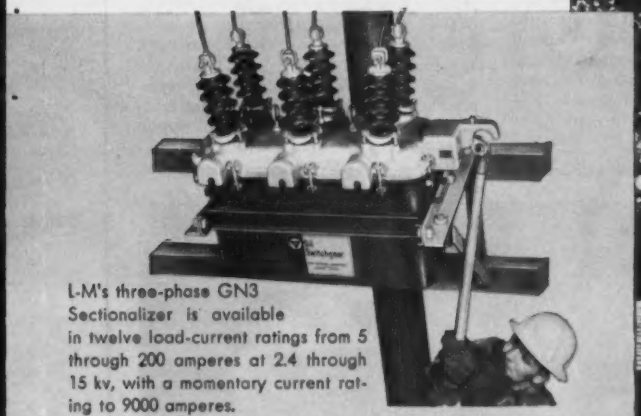
Just the reverse has been decided for an Arctic installation. Nuclear power and heat for Frobisher Bay, at the lower end of Canada's frozen Baffin Island, would cost 22% more than that from an oil-burning plant. The installation would produce 2,000 kw of electricity and 17,500 kw for centrally heating the new community of 1,500. For twice these outputs, however, the nuclear facility would cost only 2% more than the conventional one.

Elsewhere in Canada, a second large reactor unit is being considered for construction alongside 200-Mw CANDU. Space here has already been provided. Decision will wait until the Nuclear Power Demonstration (NPD) prototype reactor at Rolphton, Ont., goes into operation. Both NPD and CANDU are D_2O-moderated. An expanded program of cooperation for the development of this type and other heavy-water-moderated types of reactors has been agreed upon by the AEC and Atomic Energy of Canada, Ltd. The five-year program will include the exchange of information, cooperation in research and development, the exchange of personnel and "transfer of certain materials."

Wide interest has been shown in nuclear plants in the 20-100 Mw range by 50 countries' representatives, who will attend a conference on Small and Medium Power Reactors in Vienna Sept. 5-9. Of the 250 participants, who will discuss technical and economic achievements and potentialities of reactor plants in this range, the biggest group is coming from highly developed, but small, nuclear have-not nations. This meeting will immediately precede the fourth General Conference of the International Atomic Energy Agency.

The AEC has turned down proposals by industry to produce fuel-element billets for its New Production Reactor (NPR) at Hanford. The Commission said the four proposals "exceeded by a substantial margin the cost of producing these billets in AEC facilities," with the AEC costs "adjusted to include costs not normal to government operations but common to commercial enterprises."

Puget Power Installs GN3 Sectionalizers For Automatic Protection Of 12.5 kv Line



L-M's three-phase GN3 Sectionalizer is available in twelve load-current ratings from 5 through 200 amperes at 2.4 through 15 kv, with a momentary current rating to 9000 amperes.

Puget Sound Power & Light Company has simplified coordination of its 12.5 kv distribution lines by utilizing L-M's new 3-phase GN3 Sectionalizers. Now when permanent faults occur, they can be isolated and maximum service continuity will be maintained.

In some cases, in order to utilize the counting feature of the GN3, oil circuit breakers were replaced with faster operating L-M reclosers. Faulted lines are isolated by this GN3 sectionalizer after three operations of the back-up recloser or station breaker.

L-M's 3-phase GN3 is a self-contained heavy-duty sectionalizer. The GN3 operates only when the back-up recloser is open; therefore it interrupts no current. It may be set to lock out after one, two, or three operations of the back-up recloser.

GN3 Sectionalizers have simplified the coordination of Puget Sound Power & Light Company's 12.5 kv distribution line. With the GN3 permanent faults are isolated and maximum service continuity is maintained.

Get Complete Information

Contact your L-M Field Engineer and learn how simply the GN3 can be installed on your line; or write for Bulletin CR6. Line Material Industries, Milwaukee 1, Wisconsin. In Canada: CLM Industries, McGraw-Edison (Canada) Limited, Toronto 13, Canada.

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Reclosers, Sectionalizers, and Oil Switches

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☐ Please send me Bulletin CR6 on the GN3 Sectionalizer.
☐ Please have L-M Field Engineer contact me.

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City & Zone_____ State_____

Gas turbines show their breeding

By R. L. Steer, Project Engineer, Brown Boveri Corp.

Brown Boveri gas turbines have the "solid" look of steam turbines. The casings are machined castings. The rotor shafts are large. Bearings and other parts are easily accessible. Each turbine has a single, rugged combustion chamber.

This family resemblance comes naturally. Brown Boveri gas turbines were designed from the start for continuous stationary service . . . in contrast to lightweight units adapted from aircraft engine designs.

The first large gas turbine-generator, a 4,000 kw unit, was built by Brown Boveri and installed in 1939. It is still operating.

The world's largest gas turbine generating plant at Port Mann, Canada, is unattended! Its four 25mw Brown Boveri units are fully automatic and remote controlled.

Overhaul of two Brown Boveri gas turbine sets at the Pertigalete Cement Works, Venezuela, showed a typical condition: after 15,000 operating hours, components were almost like new. No sign of wear. No repairs or parts changes required.

Scores of Brown Boveri stationary gas turbines totalling over 1,300,000 kw installed capacity are driving generators, compressors and blowers in nearly continuous trouble-free operation—year after year. No other manufacturer can match this experience.

About Brown Boveri gas turbines: Sizes: 2,800 to 30,000 kw output. Single shaft sets for low initial cost. Double shaft, multi-stage units for lowest cost per kw and higher efficiency. Dual burners, quickly adaptable to gas or liquid fuels. Stationary, semi-mobile or mobile mounts. Completely automatic or remote controls.

A Brown Boveri two-stage gas turbine. This turbine drives a 25 mw generator part of which is visible at the lower right corner of the photo. Starting time from cold to full load is less than 20 minutes.

BROWN BOVERI Brown Boveri Corp., Dept. EW8, 19 Rector Street, New York 6, N. Y. Agents in 27 U. S. cities.

LOWEST-COST
TRANSMISSION LINE

Armless pole design eliminates crossarms, braces, hardware . . . saves up to one-third in material . . . more in labor of erection. Because insulator is stronger than crossarm, permits longer spans, larger conductors, greater safety margins. Requires narrowest ROW. Easiest-ever for hot-line work.

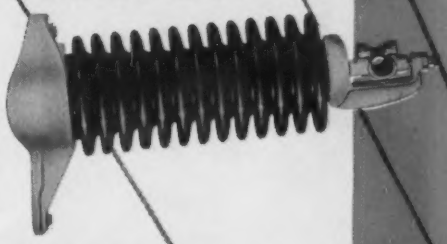
BEST-PERFORMING
TRANSMISSION LINE

Horizontal mounting of Line Post encourages uniform wetting and self cleaning, improves wet flashover values by as much as 15% over upright ratings. Eliminates contamination flashover and pole-top burning.

BEST-LOOKING
TRANSMISSION LINE

Neat, unobtrusive appearance avoids customer objection in urban and suburban residential construction. Can handle 69 kv, or higher, yet looks more like a "small" distribution line. Permanently free of RIV and TV interference, too.

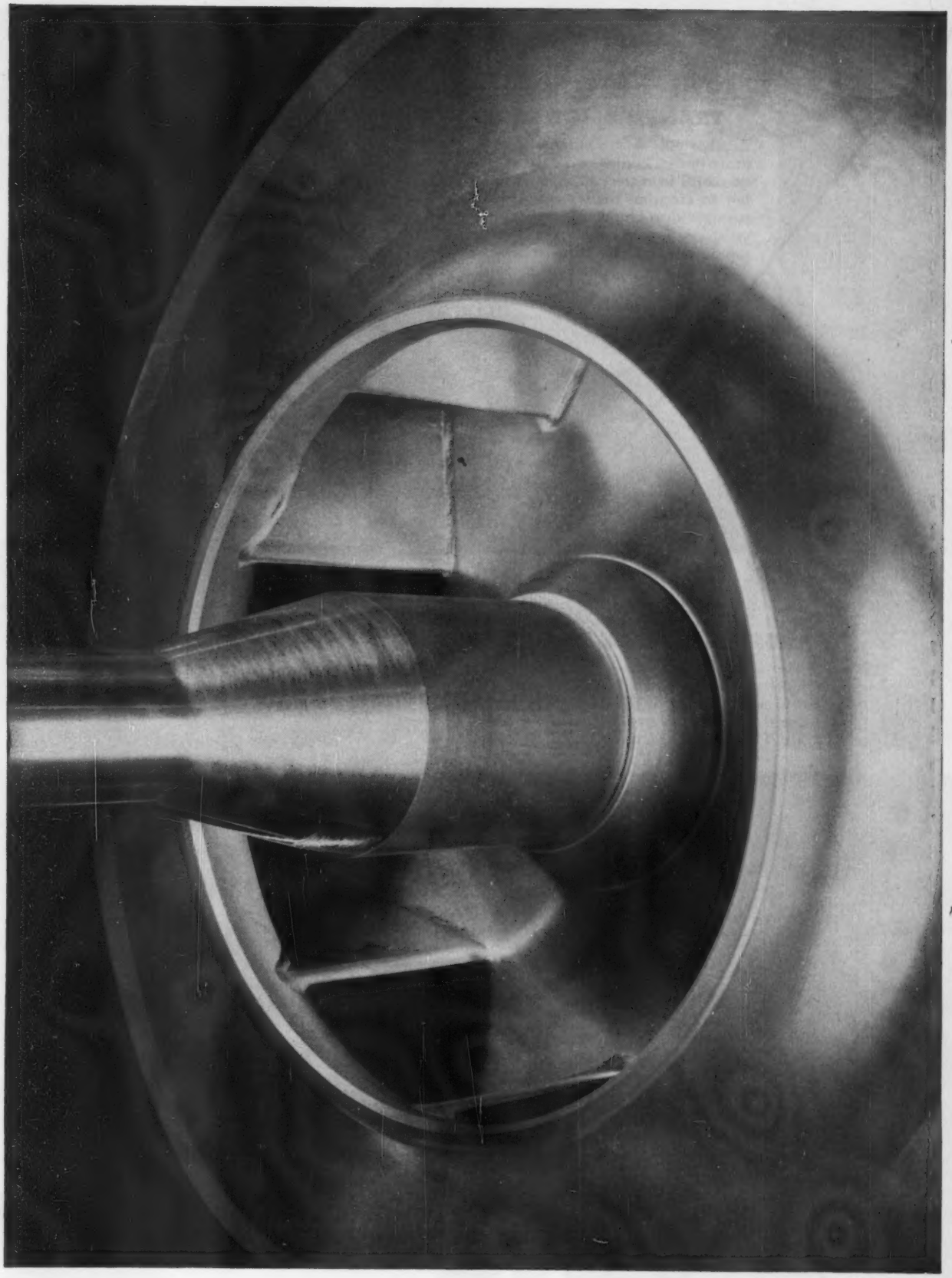
the insulator for armless transmission



Lapp Line Posts with clamp-top and integral-base-and-gain for horizontal mounting are available in voltage ratings of 35 kv, 45 kv, 55 kv, 66 kv and 88 kv. Each insulator is held by two through-bolts, and entire structure is easily assembled on the ground before erection.

Lapp

Modern armless construction with Lapp Line Posts is explained in detail in the new Lapp Catalog No. 8. Write for your copy.
Lapp Insulator Co., Inc., LeRoy, N. Y.



Engineering Excellence Pays Off In Operating Efficiency

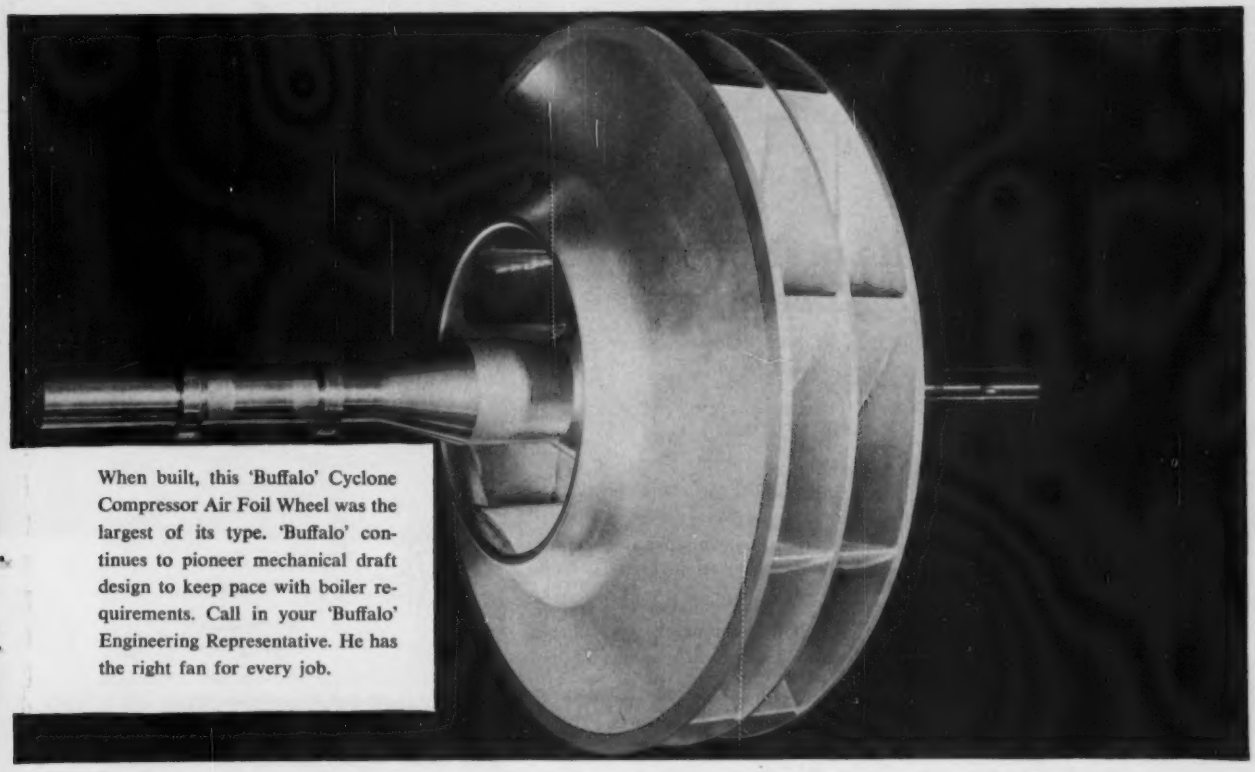
'BUFFALO' CYCLONE COMPRESSOR

HIGHLY EFFICIENT

Tailor-made to each job, these cyclone compressors provide power savings unobtainable with other designs. Exclusive engineering features such as generous inlet boxes, semi-circular inlet bell and matching wheel flange, deep air foil blades, streamlined scroll and divergent outlet all contribute to high static efficiency and lower noise levels.

TYPICALLY DEPENDABLE

Designed, engineered and built for years of continuous, trouble-free service. Hammered forgings, machined all-over, are used in all highly stressed areas. ¾"steel plate is used in housings and ½" plate in boxes. Engineered welding is double-checked by X-ray. Sleeve type bearings are supplied with circulating oil system where required. Engineered sound attenuators are available.



When built, this 'Buffalo' Cyclone Compressor Air Foil Wheel was the largest of its type. 'Buffalo' continues to pioneer mechanical draft design to keep pace with boiler requirements. Call in your 'Buffalo' Engineering Representative. He has the right fan for every job.

"Buffalo"

BUFFALO FORGE COMPANY

Buffalo, New York

Buffalo air handling equipment to move, heat, cool, dehumidify and clean air and other gases.

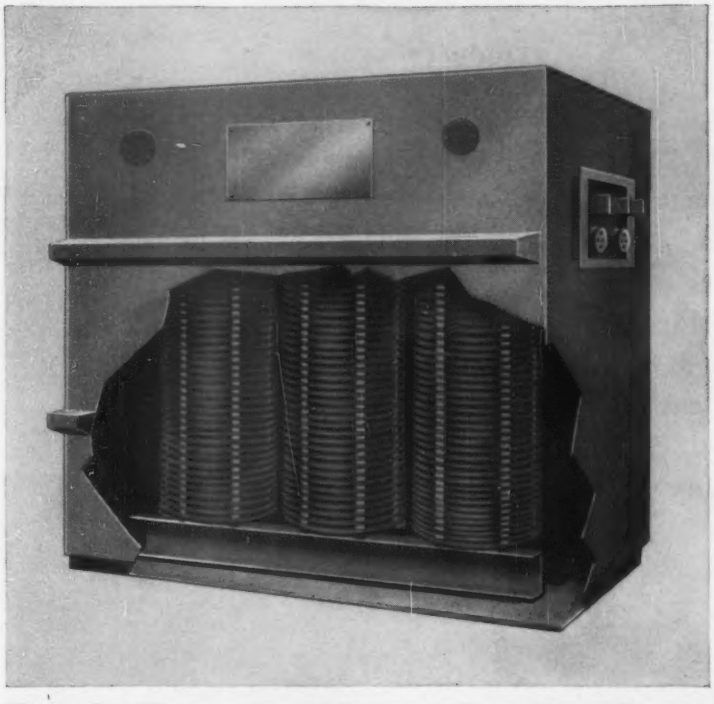
Buffalo Machine Tools to drill, punch, shear, bend, slit, notch and cope for production or plant maintenance.

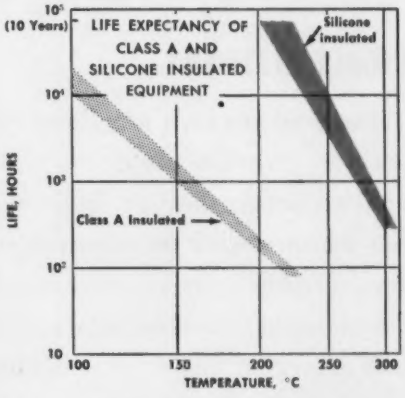
Buffalo Centrifugal Pumps to handle most liquids and slurries under a variety of conditions.

Squier machinery to process sugar cane, coffee and rice. Special processing machinery for chemicals.

SILICONE NEWS from Dow Corning

The Inside Story on Costs





Look Deeper than the Surface When Specifying Transformers

What a transformer will or won't do . . . its installation and maintenance costs . . . are determined to a large degree by its insulation.

You can assure these four cost-saving factors by specifying a silicone insulation system:

Lowest Cost Installation: Easier to handle and easier to install, they require no costly vaults or barriers . . . can be placed right at load or load center for additional savings on costly low-voltage cable. Silicone insulated dry-types are up to 40% lighter than non-inflammable liquid filled units. Minimum floor loading means least costly supporting structure.

Lower Operating and Maintenance Costs: Virtually maintenance-free, silicone insulated transformers have no liquids to filter or change. Need no space heaters to keep windings dry when de-energized.

Maximum Safety: Completely dry, they're completely safe! No danger of fire . . . no toxic fumes. Silicone insulated transformers have proved safe under extreme overload and short circuit conditions.

Maximum Reliability: Depending on design, they withstand overloads of 25% to 50% and more above rated capacity. The extra thermal capacity of silicones, demonstrated by the curves in the next column, assures uninterrupted, reliable power.

Today, transformer manufacturers offer two basic designs insulated with Dow Corning Silicones—sealed dry-types and open dry-types.

For power station auxiliaries, you can achieve maximum reliability and minimum maintenance with a silicone-insulated sealed dry-type unit. Requires only a periodic check of pressure gauge and bushings. Or you can save weight by specifying a silicone-insulated open dry-type unit . . . it's ideal for balconies and other minimum floor loading areas.

For underground distribution systems, select a silicone-insulated sealed dry-type network transformer. Fits easily into existing vaults. Undamaged even if flooded, only the bushings, pressure gauge and case need infrequent inspection.

Sealed dry-type transformers require virtually no upkeep.

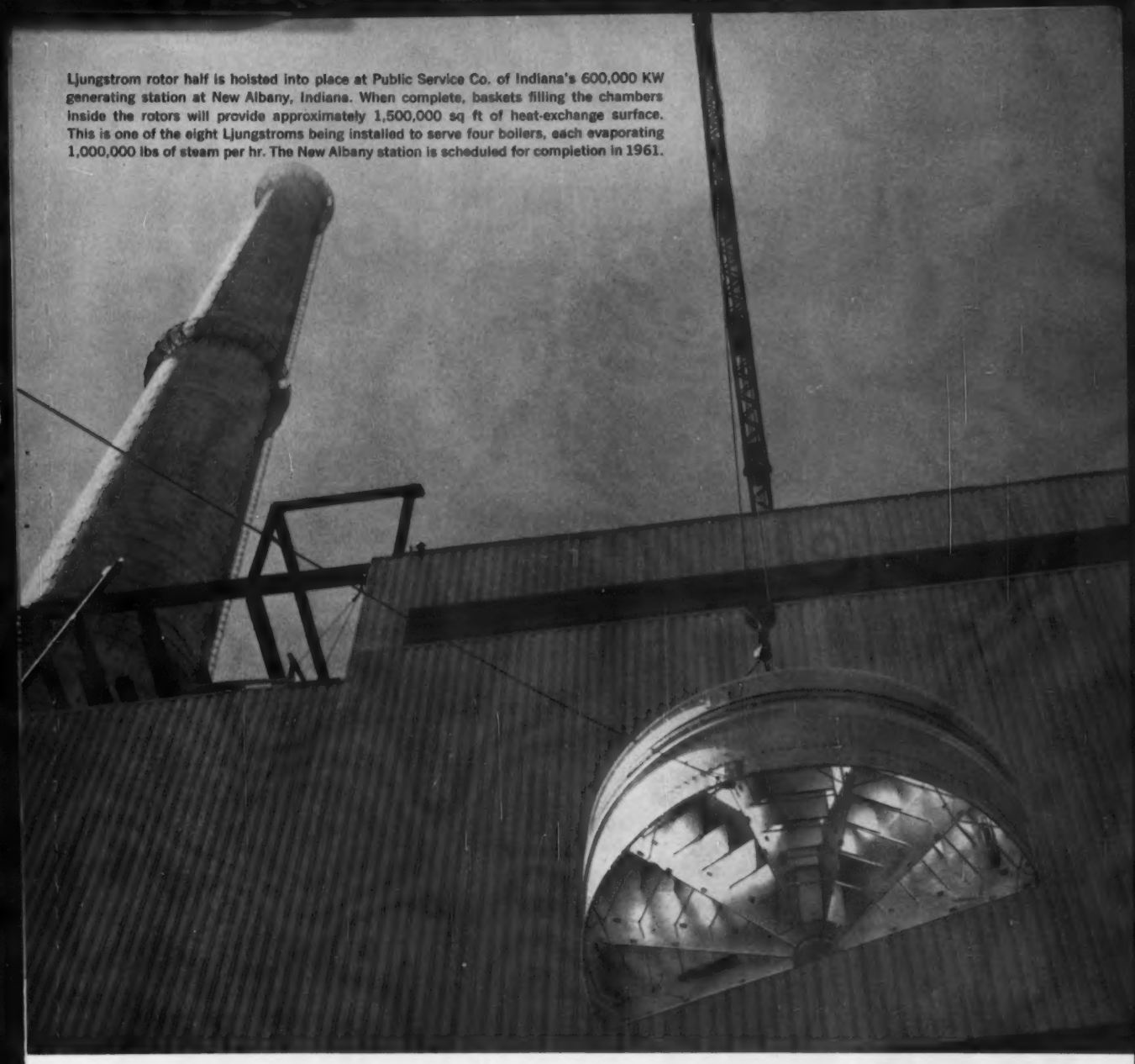
Send today for full information on silicone-insulated, dry-type transformers and list of manufacturers offering equipment insulated with Dow Corning Silicones. Address Dept. 3108.

SPECIFY Dow Corning Silicones and **SAVE!**

first in silicones

Dow Corning CORPORATION
MIDLAND, MICHIGAN

ATLANTA BOSTON CHICAGO CLEVELAND DALLAS LOS ANGELES NEW YORK WASHINGTON, D. C.



Ljungstrom rotor half is hoisted into place at Public Service Co. of Indiana's 600,000 KW generating station at New Albany, Indiana. When complete, baskets filling the chambers inside the rotors will provide approximately 1,500,000 sq ft of heat-exchange surface. This is one of the eight Ljungstroms being installed to serve four boilers, each evaporating 1,000,000 lbs of steam per hr. The New Albany station is scheduled for completion in 1961.

BEHIND NEW ALBANY'S **LJUNGSTROMS®** —**LIFETIME AIR PREHEATER SERVICE**

One of the major reasons why Public Service Co. of Indiana, Inc., chose Ljungstrom for its new generating station at New Albany is Lifetime Air Preheater Service.

Lifetime Air Preheater Service means that Ljungstrom engineers make regular calls *throughout the life of each unit.* They check to make sure your Ljungstroms are working at top efficiency, and that they'll continue to work that way. This service policy covers all Ljungstroms—right from the very first installation made in 1923.

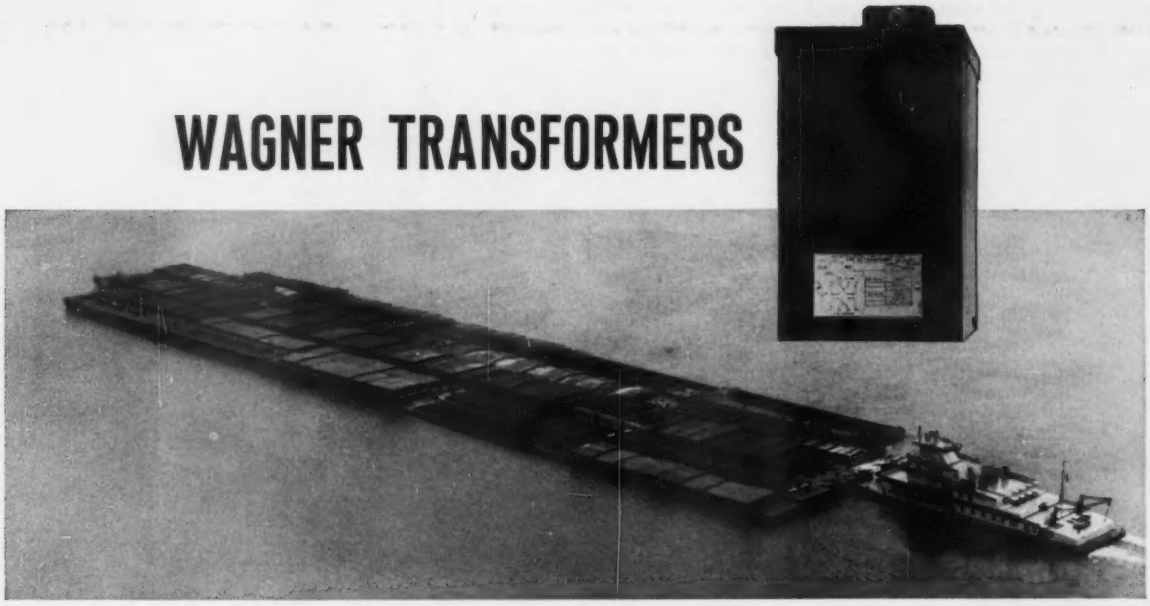
But that's not all. Air Preheater provides first-rate *emergency* service, too. For instance, a Ljungstrom customer in the southwestern U.S. recently called on a Wednesday night for replacement parts. Air Transport looked like the fastest way, but schedules indicated a minimum three-day delivery time. So Air Preheater loaded the parts on a pickup truck, and their men drove them more than 1,000 miles to their destination...34 hours straight driving. The parts were installed and in service by Friday morning.

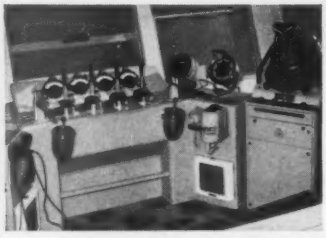
Fast response to emergencies and regular inspection of Ljungstrom installations are two of the many advantages Air Preheater provides. Another is expert knowledge of boiler and preheater problems gained from over 35 years' experience. Perhaps these reasons explain why 9 out of 10 preheaters sold today are Ljungstroms.

THE AIR PREHEATER CORPORATION

60 East 42nd Street, New York 17, N. Y.

WAGNER TRANSFORMERS





RIDE OL' MAN RIVER

Out in the channel, that's Federal Barge Lines' M.V. UNITED STATES. Designed and built by St. Louis Shipbuilding & Steel Co., she's the most powerful towboat on America's inland waterways. Headed up the Mississippi, this 8,500 horsepower giant pushes a record-breaking 42 barges, the equivalent of seven and one half acres. The boat is designed to push 40,000 tons of cargo, the capacity of a freight train 1,000 cars long.

You'll find seven Wagner Dry-Type General Purpose Transformers on duty aboard the UNITED STATES. Six 10 Kva and one 7½ Kva transformers (all 480 volt primary, 120/240 volt secondary, with 2 extra primary taps) are used to power this muscled lady's lighting system, small motors, and most of her navigation equipment.

Ashore or afloat, Wagner Type AE Transformers can be used for all general purpose applications, including those where noise must be minimized. They have a low sound level, the result of encasing smaller Form W core and coils in solid epoxy compound... give you a whisper-quiet transformer that can be used anywhere noise would be a nuisance.

Wagner Type AE Transformers have insulation protection suitable for continuous operation at 80°C in a 40°C ambient. All parts are sealed from dust, moisture, and corrosion by the epoxy compound. Naturally, every unit is built to conform to all applicable standards of ASA and NEMA.

Wagner Type AE Transformers can be installed indoors or out... anywhere they will not be submerged or exposed to injurious fumes in concentration. Compact and lightweight, they can be mounted in any position at any angle, on walls, floors, or ceilings.

Like to know more? Wagner branches and distributors have all the details. There's one near you, listed in your 'phone book. Call or write. Soon.

WT60-13

Wagner Electric Corporation

6456 PLYMOUTH AVENUE, ST. LOUIS 33, MISSOURI

Price Increase!
From $2.00 to $100.00 (?)

With a man on top of the pole, with equipment on hand, the extra cost of installing one more 6-inch deadend insulator unit when building a distribution line is currently $2.00.

Later, when it becomes a special job, when it may call for hot sticks, when the extra insulation length demands re-sagging the conductor and perhaps re-building jumpers, this same insulator might cost you $100.00.

In the meantime, the insulator is not wasted. It gives you added impulse protection at deadends. And then when you *really* need it - - when that inevitable day arrives for primary voltage to go up - - that same insulator will be worth its weight in gold!

On the day of construction, future protection is cheap. It's the only time when just a couple of dollars will give you "one to grow on".

OHIO BRASS COMPANY, MANSFIELD, OHIO
Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

Ohio Brass HOLAN

PORCELAIN INSULATORS • LINE HARDWARE • CAPACITORS • LIGHTNING ARRESTERS
BUSHINGS • HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES • BRONZE VALVES

10030-H1

FUTURA®

suspension insulators

with C.I.S.*

control "necking" corrosion of insulator pins

"Necking" corrosion of suspension insulator pins is a familiar problem with many utilities. In recent years, O-B engineers have received insulators similar to the one shown at the upper right from heavily contaminated areas in West Virginia, Pacific coast, Ohio, Pennsylvania, Florida, the Gulf coast, and elsewhere.

The necked down pins of these insulators represent not only an outright loss to the costly thievery of corrosion, but also a threat to safety and income.

But it doesn't have to happen - - and it doesn't take expensive "specialties" to prevent it from happening!

Futura's Corrosion Intercepting Sleeve, during 16 years of service in heavily contaminated atmospheres, has been *proved* effective against this form of corrosion.

As illustrated below, the Corrosion Intercepting Sleeve acts as a drip-shield for the pin, preventing moisture (and the corrosive salts dissolved in it) from draining continuously down the exposed shank of the pin.

Of the hundreds of Futura insulators exposed to severe contamination for up to 16 years, not one shows the characteristic and well-defined signs of necking corrosion!

Is this the solution to one of your problems? . . . isn't it worth looking into?

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass HOLAN

PORCELAIN INSULATORS • LINE HARDWARE • CAPACITORS • LIGHTNING ARRESTERS
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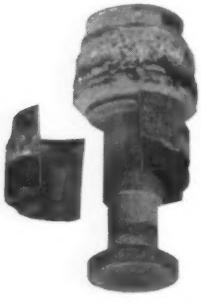
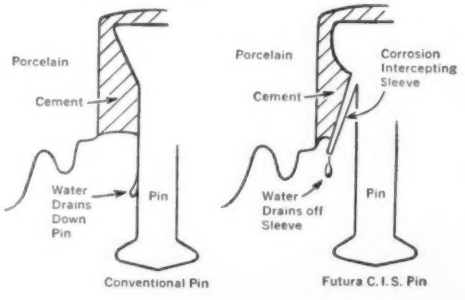


Left: Removed from a sound insulator after 16 years of service in a heavily contaminated atmosphere, this prototype Futura pin shows absence of corrosive attack. Narrow rim of the sleeve itself sheds all but the smallest droplets of moisture (which evaporate quickly), does not sustain continuous or massive attacks.

Right: In a conventional insulator, corrosive salts dissolved out of air-borne contaminants are allowed to drain down the exposed shank of the pin. In the Futura insulator, this drainage path is interrupted by the Corrosion Intercepting Sleeve, protecting the pin from continuous and massive attack.



if this is your problem . . .

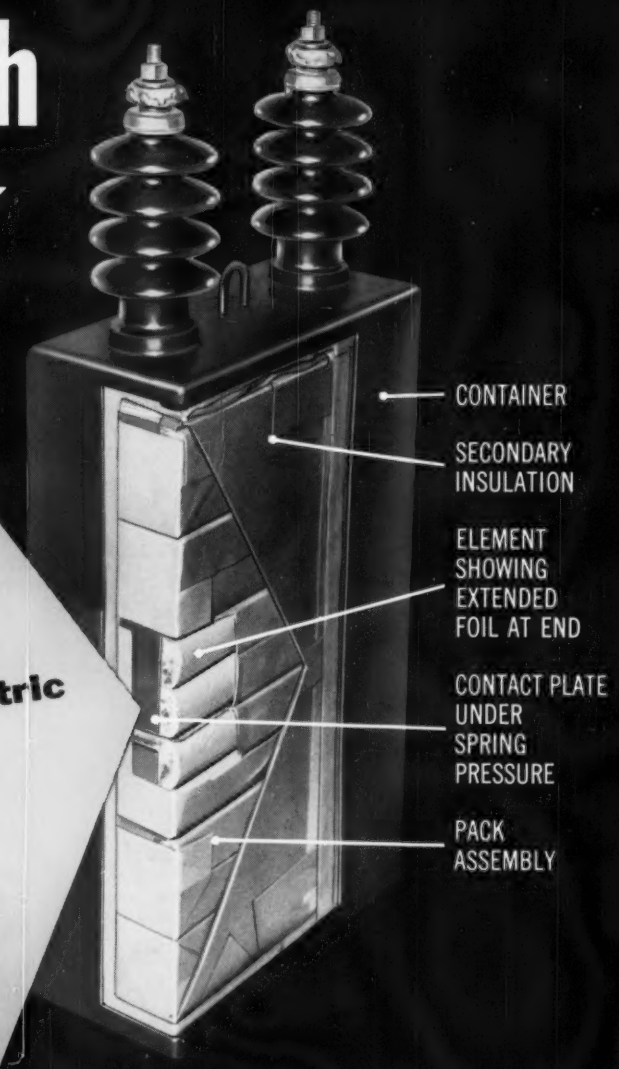
Pin of this conventional insulator shows advanced stage of necking corrosion after 30 years' exposure in a heavily contaminated atmosphere. Corrosive salts, dissolved out of air-borne contaminants by moisture, collected on the underside of the porcelain disc and then diffused across the cement joint to drain down the exposed shank of the pin.

Futura insulator, with the exclusive Corrosion Intercepting Sleeve (C.I.S.), prevents massive corrosive attacks on the insulator pin. Sleeve acts as an umbrella (see sketch at left) to divert corrosive salts from their customary drainage path down the exposed shank of the pin.

this is your solution!

* Corrosion Intercepting Sleeve

Exclusive with VAREX®



contacts are made outside the active dielectric under strong spring pressure

Varex is the *only* capacitor whose elements are totally free of mechanical insertions in the active dielectric!

Varex engineers have eliminated these mechanical insertions, or tabs, from the dielectric by means of the exclusive "extended foil" design. As shown above, every turn of foil extends beyond the paper dielectric and makes a broad contact with a plate under strong spring pressure.

This exclusive Varex design has thus removed a possible source of mechanical damage during winding, and a cause of higher electrical stress in the adjacent paper dielectric.

This means lower current density, cooler operation, and appreciably longer life for Varex capacitors!

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass

HOLAN

PORCELAIN INSULATORS • LINE HARDWARE • CAPACITORS • LIGHTNING ARRESTERS
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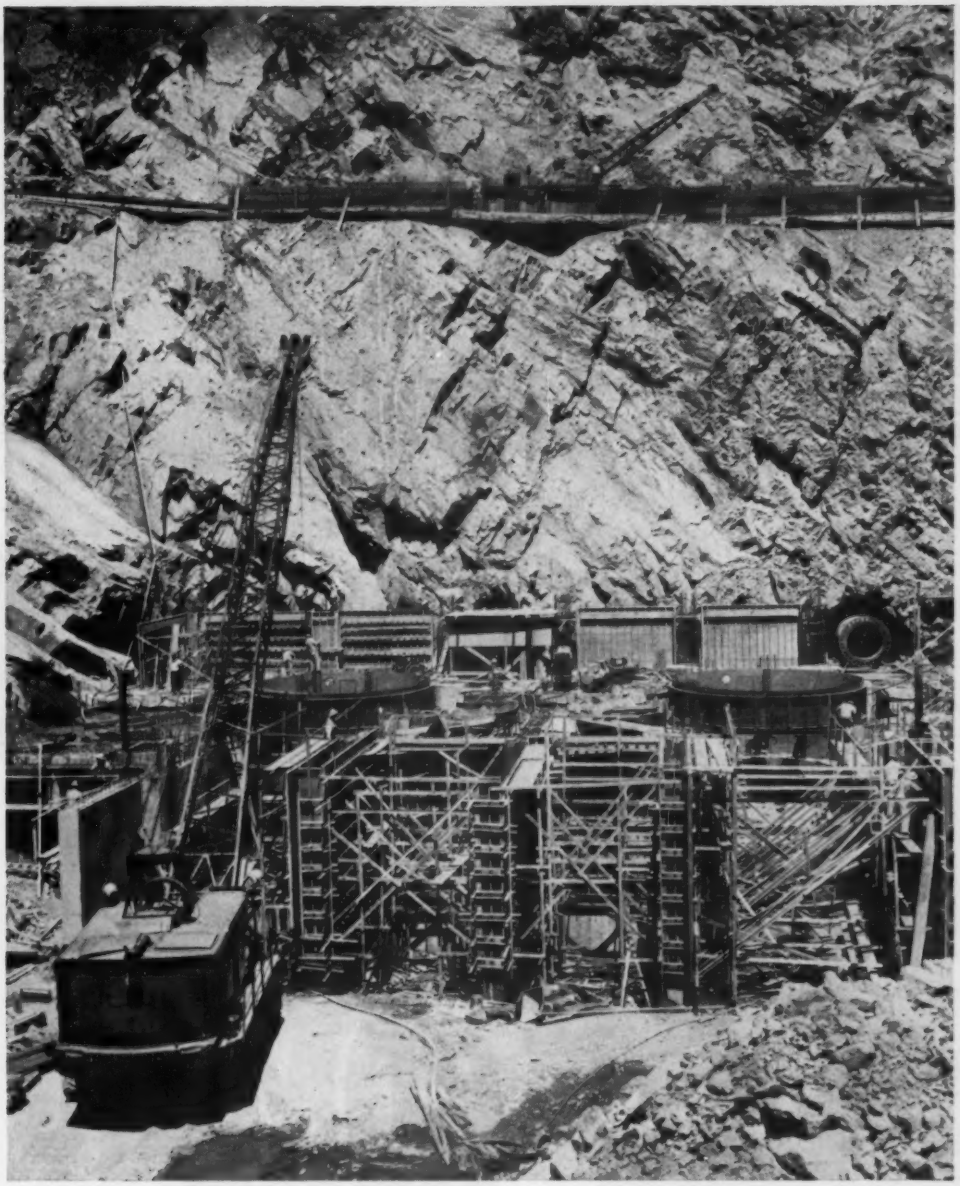
10030-H4



Foundation construction, Jaybird powerhouse

BECHTEL EXPERIENCE AT WORK IN

Hydro-Electric Power

Power plants designed and built by Bechtel range from relatively small individual power stations to major systems.

Among current hydro-electric projects is the 10-year development by which the Sacramento Municipal Utility District is harnessing the waters of the American River to create power, control floods and add to the fishing, camping and recreational resources in the Sierra Nevada.

Engineering has passed the half-way point and construction entered its third year last May.

Working closely with the District's engineers, Bechtel is responsible for engineering design and management of construction of this project.

Inquiries are invited from those who are considering new or expanded facilities—hydro-electric, steam or nuclear.

BECHTEL CORPORATION

Engineers and Builders for Industry

SAN FRANCISCO
Los Angeles
New York
Houston

CANADIAN BECHTEL LIMITED

Montreal
TORONTO
Calgary

COMING YOUR WAY ...a new

THIS IS THE ONE, developed to meet your needs... the Sangamo J3 Singlephase Watthour Meter. No warmed over, weary, compromise copy this. No follow the leader, last-with-the-least version of any other meter in the world. This is the J3... the only meter with true magnetic flotation. The one new, noteworthy development in watthour meters this year. One of the exceptional advances in metering in any year!

The Sangamo J3 has these new features:

TRUE MAGNETIC FLOTATION... the moving system of the J3 is not suspended, supported, harnessed or trapped. It floats, pure and simple, permanently and without friction, on a field created by Alnico magnets that are dimensionally and magnetically uniform.

VISIBLE, SELF-CLEANING GAP... because the magnets repel each other, the gap stays clean; it cannot be bridged by metal particles.

CONTROLLED FLOATING SYSTEM... in the J3, endshake is controllable to assure best performance on high loads. The dual damping magnets in the J3 substantially reduce side thrust, and tilt-error is insignificant. These features, combined with the unique slow speed of Sangamo J Meters, give you a moving system that is *guaranteed for life.*

ADVANCED INSULATION LEVEL... Epoxy-coated current coils, proven on Sangamo polyphase meters, provide better insulation, facilitate heat dissipation.

SMALLEST SIZE... the J3 is smaller than other meters, making it easier to handle.

NEW DESIGN... provides better visibility for inspection and testing.

Plus these traditional Sangamo advantages:

HIGHEST TORQUE... up to 15% more than that of any other meter.

SLOWEST SPEED... 40% fewer revolutions than any other meter.

LOWEST STARTING WATTS... starts to operate before any other meter; requires 25% fewer starting watts to begin measuring; total watts loss is lower.

SECTIONALIZED CONSTRUCTION... any component can be inspected and replaced without completely disassembling the meter. Many parts are interchangeable with J and J2 meters.

CORROSION RESISTANT FINISHES & MATERIALS... end maintenance problems caused by weather and atmospheric conditions.

GLASKYD BASE... with tremendous impact strength that shrugs off rough treatment. Has better arc tracking resistance, too.

Your Sangamo Representative is coming your way with a sample of the new J3. Probe, pry, pore over it. Write it into your standards. Then, put it to work... for this has everything you want in a watthour meter. And that's a promise, for this is one of the really great ones.

watthour meter...the Sangamo

true MAGNETIC flotation

J3

SANGAMO ELECTRIC COMPANY/SPRINGFIELD, ILLINOIS

JM60-3

(Advertisement)

".....we knew you would want all these switchgear advances. And we were determined to bring them to you at the lowest possible cost."

—Frederick G. Schmidt, Manager Switchgear Division, I-T-E Circuit Breaker Company

Frankly, we had a big decision to make when we were designing this new HK metal-clad switchgear. Should we go ahead with a complete redesign or should we simply add the new features we knew you wanted to our previous models? The latter would have been easier, and it still would have put us well ahead of the field. But we decided it would be more honest to give you the benefit of as much progress as possible as soon as we could. And we were confident that in this case we could give you all these advances at a price no higher than you would pay for equipment with none of them.

First we wanted to give you stored energy closing. No circuit breaker in this class can really be called modern today without this feature. It insures that you can have fast, uniform closing every time. In fact, I-T-E makes it possible for you to close the breaker even during emergencies when you have lost control power. Fast closing reduces breaker upkeep—prolongs contact life. And I-T-E's motor-driven spring charging mechanism needs only about one-tenth the power of other devices. So you can enjoy the economy of a smaller battery or control transformer.

To give you still greater safety too—again with no increase in cost—we designed this switchgear so you never need open the doors to move the breakers. You can go all the way from connected through test position, to disconnected, and back again with the door closed. Where else can you find safety like this in metal-clad switchgear? Even an inexperienced man can operate it in complete safety. Because we were designing this equipment completely new from the ground up, we had the opportunity to make the components more accessible and provided more elbow room inside the compartments. The bus is higher, for example, making installation and inspection easier. The control cables are brought in at the front for convenience and safe access away from the high-voltage bus. The current transformers are located behind the shutter in the circuit breaker compartment and may be easily changed without disassembling the bus or cable connections.

We were meticulous from the beginning about taking full advantage of the many new materials now available for switchgear use. And through careful selection of materials, skillful arrangement of components, and shrewd economy of space, we were able to give you all these advances in a substantially smaller package as standard equipment. The gear fits under lower overheads and in narrower aisles. Yet it gives you actually more usable space inside than you had before. Circuit breakers are lower, lighter and easier to handle. Instruments are at eye level. We believe you will agree there is no finer switchgear available today anywhere.

A complete description of this equipment is contained in our new illustrated Bulletin 2801-2A. Send for your copy. And ask to see our new sound strip film. We'll bring it to your office. You can see it in 18 minutes. I-T-E Circuit Breaker Company, Dept. SW, 1900 Hamilton St., Philadelphia 30, Pa.

Cost-cutting step taken 26 years ago still paying off at Hamm Brewery –they chose NONPAREIL Turbine Oil

Situation: In 1934 the Theo. Hamm Brewing Company installed two 1,000 kw. turbines. The brewing firm wanted to be sure there would be no downtime due to failure of the lubricant. Neither did the company want to spend time checking the oil's performance or adding new oil to sweeten the old.

What was done: Brewery management followed the advice of the Standard Oil lubrication specialist. They installed NONPAREIL Turbine Oil, the only oil, then as now, that carries with each fill a life-of-turbine guarantee.

What has happened: In 26 years since the turbines were put in service there has never been any downtime due to lubrication problems. In 1947 a 2500 kw. turbine was added to the system and another 3000 kw. unit was put in service in 1953. These, too, have used NONPAREIL Turbine Oil with the same results.

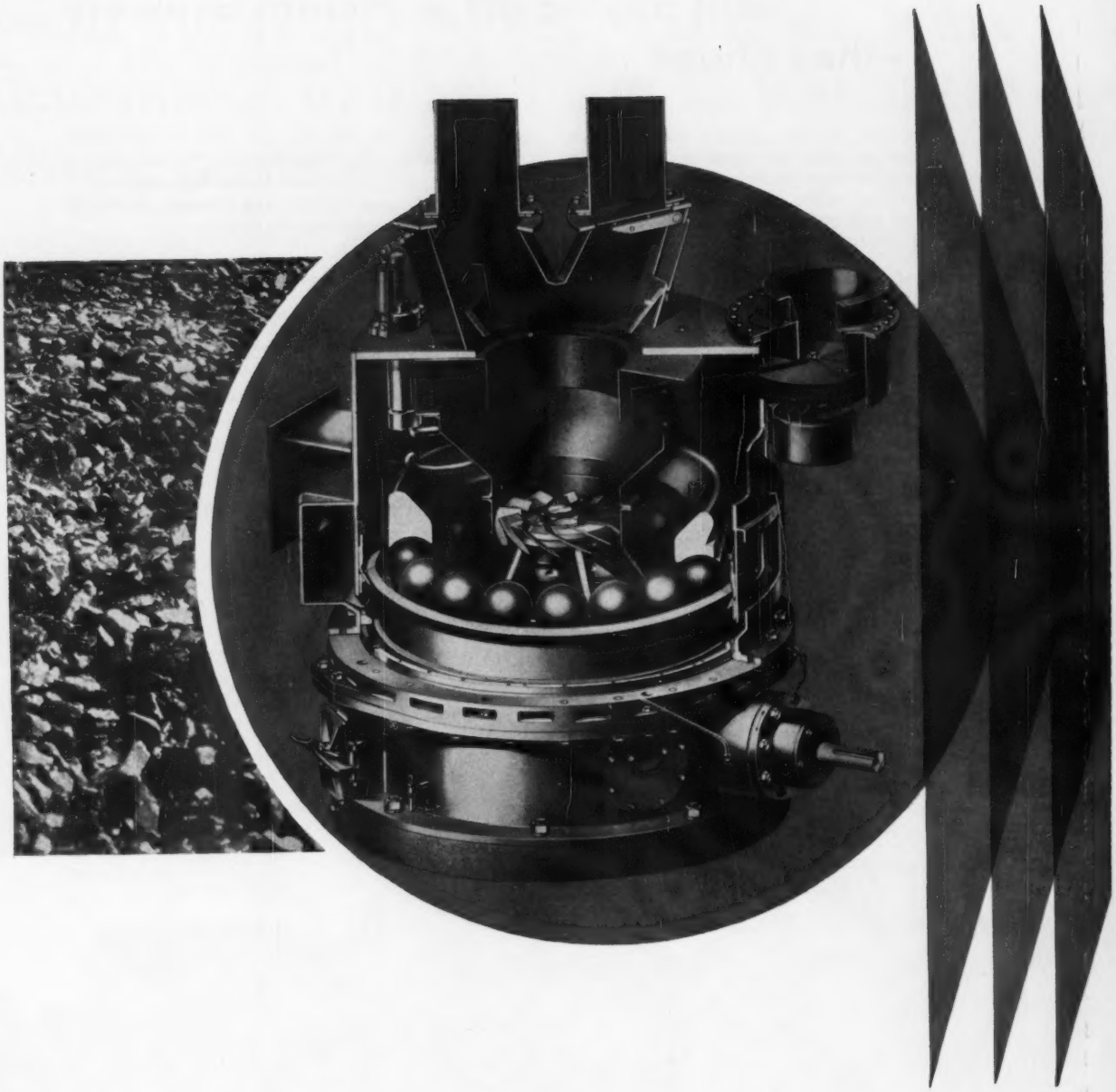
What you can do: Get the full story on NONPAREIL Turbine Oil from the Standard Oil office near you in any of the 15 Midwest and Rocky Mountain states. Or write **Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.**

Quick facts about **NONPAREIL Turbine Oil**

- Will not permit formation of harmful acids
- Will not permit formation of sludge or oil varnish
- Will maintain good demulsibility or water separating characteristics
- Has high resistance to foaming
- Contains adequate rust inhibitor

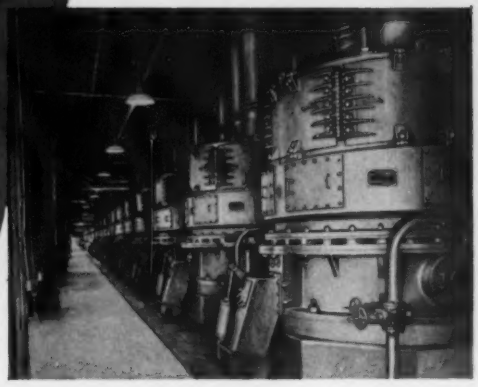
You expect more from **STANDARD** *and you get it!*

Hamm Brewing Co. assistant chief engineer Steve Wappel and Standard's Dick Anderson discuss recent oil analysis. Dick Anderson knows his way about an industrial power plant. He's been providing customers with technical service on lubrication for five years. Dick has an engineering degree from the University of Minnesota and has completed the Standard Oil Sales Engineering School.



Design Simplicity Cuts Pulverizer Maintenance

B&W offers a compact, Space-saving Unit for Efficient Grinding



Proved in hundreds of installations: B&W Pulverizers produce exceptional output records, year after year. B&W engineering combines high efficiency with unusual compactness and ease of maintenance. For example . . .

Simple, Accessible Arrangement makes routine maintenance easy, quick and safe. Adjustments can be made readily, without shutting down the unit. Fan maintenance is minimized, because the B&W Pulverizer uses *only clean primary air,* supplied under pressure. This means simpler, more economical fuel piping, too. And, no special distributing devices are needed . . . the pulverizer acts as its own distributor.

Delivers Uniform High Fineness, consistently, over its entire service life. Only material of the proper fineness can leave the B&W Pulverizer, because its high circulating load promotes efficient and dependable product classification. Proper grinding contact is maintained by spring-loaded ball bearing grinding elements, operating at a slow speed. Special-alloy grinding components will last two years or more on eastern coals and at least one year on midwestern coals.

No Trouble with Low Grade or Wet Coal, because the B&W Pulverizer *recirculates* the fuel through heated air, and regrinds oversize particles. This unique feature — exclusive with B&W—assures maximum utilization of even lowest-grade coals, whether too dry or soaking wet. It eliminates capacity losses, shutdowns or special attention.

Takes All Types of Automatic Controls. The B&W Pulverizer features "one point contact with the boiler" . . . an uncomplicated arrangement by which the boiler's automatic combustion control regulates the pulverizer by adjusting only the damper in the primary-air duct. The pulverizer's own control system regulates all other functions, including fuel-air ratio and operating temperature.

To Get Full Information about the advantages of the B&W Pulverizer and Pulverized-Fuel Firing Systems, write today to The Babcock & Wilcox Company, Boiler Division, Barberton, Ohio.

B&W

THE BABCOCK & WILCOX COMPANY

BOILER DIVISION

G-958

It may be old hat, but it wears well.

KERITE CABLE

it's the **KERITE** *that makes the difference*

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No Sovereignty Loss in System 'Mergers'

The investor-owned utilities have made a start toward integrating their individual systems into pools.

Yet almost without exception, *intra*-pool integration has moved only a few steps toward the engineering and economic ultimate of single-system planning and operation. And *inter*-pool integration consists usually of synchronizing and emergency ties between peripheries, if it exists at all.

The job has a *long* way to go to completion. But the economic benefits of complete intra-pool integration are too huge to overlook rationally.

System integration began, historically, with the mergers and acquisitions which culminated in the corporate utilities we know today. Motivations behind the amalgamations were basically financial, but the resulting system economic operating benefits were significant.

Each individual system absorbed was *completely* integrated, unless geography intervened, in the process under which both the original corporate structure and its system lost "sovereignty." Each present company system, though it consist of a number of formerly-independent systems, now can be *and is* planned and operated as an economic and engineering entity.

For all practical purposes, the corporate merger/acquisition era is over, the original financial motivations gone. Yet the system operating benefits accruing from further amalgamation are as huge as ever. And *corporate* merger is unnecessary; only *system* merger is needed.

"Pool" planning and operation is an interim step toward system "merger." But in the usual pool, not only are corporate sovereignties preserved, but so are individual system sovereignties. And too often, the latter are closely guarded by personalities and inbred parochial approaches.

Large and small objections are raised at operating, planning, and *top management* levels. Relative benefits, different operating techniques, different capitalization, and depreciation methods, and many other difficulties are permitted to block people who do not choose to admit the economic gains that are being wasted.

There may be an analogy here. The various countries of the present European trade blocs for years permitted language, monetary, ideological and political differences to blind them to the benefits of close trade association. Yet ultimately they realized their economic survival in today's shrinking world made *merger of their economic systems* mandatory. And they are moving toward it, overcoming objection after objection, first lowering tariff barriers, and eventually hoping to arrive at common monetary systems, and a true "common market."

And they are doing all this without giving up national sovereignty!

The analogy may be loose. But in the case of power companies as in the case of countries, giving up a measure of "economic sovereignty" for the attainment of significant economic advantages surely is worthwhile.

Co-op 2% Bond Investment Grows

Depreciation and amortization reserves seen as major source of cash for investment in the new US Treasury bonds

Rural electric cooperatives, just as other businesses, accumulate cash reserves for depreciation, operating emergencies, and various other reasons. Also like other businesses, they invest this cash until the time it is needed. But since co-ops are financially based on money borrowed from the government, with an interest rate of 2%, their investments of reserves at interest rates higher than 2% have been the subject of criticism from utilities, legislators, and other sources. Still, the co-ops were faced with the problem of keeping the money available for the purposes it was accumulated in the first place.

A recent solution to the problem came in the form of US Treasury bonds that pay 2% interest, mature in 12 years, and are redeemable in 30 to 60 days in the event the co-op needs the money back. In a period of just over a month, 30 electric co-ops invested $1.2 million in the new bonds, which are available to cooperatives only.

A look at the co-ops that were first to step forward to invest in the bonds reveals that most (19) are in the Midwest, and that they range in size from small to large, but are neither the smallest or largest in the nation. Those not located in the Midwest are in the South (7) and West (4).

Most recent complete figures available for comparison of the co-ops were current at the end of 1958, and this report is based on those figures. The 1959 information will be released in October.

All but two of the co-ops have made cumulative advance payments on REA funds advanced to them. In a sense, this is investment because it saves the 2% interest that would have been charged. The disadvantage to the borrower is that once the money is repaid it is not available for use. The availability of the new bonds could conceivably reduce cumulative advance payments. The 30 co-ops had made advance payments amounting to 5.8% of REA funds advanced or 7.1% of long term debt.

Most Have Funds in Investments

Besides cumulative advance payments, all but one of the borrowers have money in investments and special funds besides the new bonds. Total cash in these funds amounts to about 9.8% of total assets before purchase of the new bonds. The bonds add another 1.5%.

One of the outstanding clues to the financial soundness of the 30 co-ops is aggregate reserve funds for depreciation and amortization that amounts to 25% of their total gross electric plant. These funds, too, will be available for investment in the new bonds. In fact, it is often these reserves that have been invested in government bonds that in recent years have been yielding higher interest than the 2% charged the co-ops. REA recommends that borrowers plan for a probable annual replacement cost of between 1% and 1.5% of plant. Gross electric plant was $85,278,030 and depreciation and amortization reserve was $21,322,166, leaving a net plant of $63,955,864.

The depreciation and amortization reserves are significant, too, because it is in this respect that nearly all of the "first 30" are alike. They have D&A reserves close to or above the national average of 23%, and most of those falling below the national average are among the largest co-ops in the group. Of the others, 15 have D&A reserves amounting to 28 to 38% of their gross electric plant.

From that point on, the 30 cooperatives are individually dissimilar in most respects.

While the group as a whole averaged a revenue-per-mile of $34.54, only 17 of the 30 were higher than the national average of $30.74. The first cooperative to invest in the bonds, Lee County Electric Cooperative, Inc, Fort Myers, Fla., had a per mile revenue of $106.64, nearly 3½ times the national average. It also has the highest number of customers per mile (8), and has the lowest percentage of D&A reserve (10).

A similar dispersal is found in the kwhr figures. Only half of the group was higher than the national average. As might be expected, most of the same co-ops that had highest usage also had the highest revenue per mile of line, but there are two exceptions. Four of the co-

An Average Bond Buyer of the 30 Would Look Like This:

Miles of Line 1,561	**Number of Customers** 4,844	**REA Funds Advanced** $2,602,584	**Cumulative Advance Payments** $151,381	**Depreciation & Amortization Reserves** $710,739
Electric Plant (Gross) $2,842,601	**Investments & Special Funds** $267,932	**Total Assets** $2,724,143	**Long Term Debt** $2,133,284	**Kwhr Per Residential Customer** 4,161

ops that have above average revenue per mile are not among those with above average kwhr sales.

There is a wide spread between the largest of the group and the smallest in terms of miles of line. The largest has 2,647 miles and the smallest has 674. The range in number of customers is from 11,084 down to 997. None of the group is in the smallest category nationally, nor are there any in the largest. The spread of number of customers per mile is from 8 down to .9. Again, it is about the same 15 co-ops that are near average or above in customers per mile.

The conclusion apparent from studying the first 30 co-ops is that interest in the new 2% bonds will be tied mostly to the amount of money in depreciation and amortization reserve. This was the primary intent of the bond issue, which co-operatives asked for, and it appears that the intent will be fulfilled.

According to a report from REA, there is about $441.5 million available for investment in the new bonds by borrowers.

% of Total Assets in Investment and Special Funds	
National	Group of 30
7.85	9.8
% of Gross Electric Plant in Depreciation & Amortization Reserves	
National	Group of 30
23	25
% of Funds Advanced Returned in Advance Payments	
National	Group of 30
4.2%	5.8%
Investment Per Customer	
National	Group of 30
$868	$587
Customers Per Mile	
National	Group of 30
2.99	3.22
Average Annual Consumption by Residential Customers	
National	Group of 30
3,492	4,161
Revenue Per Mile of Line	
National	Group of 30
$30.74	$34.54

FPC Rules Out ECAP Allowance

The Federal Power Commission ruled last week that eight ads in a 1957 ECAP (Electric Companies Advertising Program) series were "political in character," and that the 76 electric utility companies who paid for them could not account for these ECAP contributions as business expenses for rate-making.

The full FPC, accepting its staff's contention, ruled that the ECAP ads must be accounted for by the 76 utilities as "miscellaneous income deductions"—after taxes are paid—rather than as ordinary operating expenses "above the line." The FPC ruled that the ECAP ad contributions must be carried in its accounting category 538, rather than in categories 787 and 801.

The FPC decision was not surprising, in that the Commission previously had prohibited the utilities' principal line of argument during hearings—that the contributions were justified as both ordinary and necessary business expenses. Instead, the FPC limited the testimony before its Presiding Examiner Edward B. Marsh to the "narrrow" issue of whether the ads were political in nature.

An appeal to the courts in Washington, D. C., will be the next step by the utilities' chief counsel, A. J. G. Priest. In fact, Priest (representing the legal firm of Reid & Priest) based his entire presentation before Examiner Marsh on the expectation that the FPC would issue an adverse decision, and the matter would then go into litigation.

The FPC first brought up the controversial ECAP situation in the fall of 1958, issuing a show-cause order after its staff questioned the propriety of the utilities' classifying of the ECAP contributions as tax-exempt business expenses. The staff claimed, successfully, that the ads were clearly intended to influence legislation, and that contributions for such activities, including lobbying, had to come out of company surpluses, not from the rate base.

A series of delays put the hearing off until January, 1959. When the hearings began, however, they were adjourned again until the full Commission could settle a technical point—whether the companies' "broad" testimony on justification of the contributions, or the staff's "narrow" line of evidence that the ads were political in nature, would be followed.

The FPC, in July, 1959, upheld its staff's position, limiting the companies to an almost undefendable position of proving that the ECAP ads did not have political nature. It became clear at that time that Priest would take the ECAP case to the federal courts, and his legal brief at the ensuing FPC hearings and oral argument reflected it.

The hearings finally were held before Marsh in November, 1959, but they had an almost elementary atmosphere. This was because Marsh ruled time and again that the companies' arguments were inadmissible, according to the FPC ruling in July. The hearing ended in four days. Marsh's intermediate decision was omitted upon agreement of both the staff and the 76 utilities. The outcome of the final order by the full Commission—a long time in coming—was anticipated.

Utilities Given 120 Days

The FPC order, issued last week, calls for utility compliance within 120 days, including a statement filed with the Commission that compliance has been made.

The Commission ruled that: **(1)** Eight of the nine questioned ads were political in nature, requiring reclassification of the companies' contributions for these ads to category 538; **(2)** That the FPC does have authority to rule on whether such ads are political; **(3)** That the FPC did not commit precedural errors in arriving at its accounting interpretation E-110 (issued in 1945), on which the show-cause order was based; **(4)** That the 76 utilities would not have their constitutional rights of freedom of speech impaired by the accounting changes.

In ruling against eight of the nine ads, the FPC reduced the total amount of contributions to be reclassified from 43.25% to 38.45% of their 1957 total ECAP contributions.

Election Year Roils Oregon Scene

Rate increases, bad weather spur public power moves. Labor group reversal seen strengthening private power position

An election year surge of public power activity in Oregon ran into unexpected opposition when the state AFL-CIO convention this month, in an abrupt departure from its 1958 convention position, refused to initiate or sponsor bills setting up a state power commission. The group also tabled a proposal to endorse the controversial Nez Perce Dam, which has had strong support from state labor figures. Although the convention similarly refused to endorse Pacific Northwest Power Co's competing High Mountain Sheep Dam, it was endorsed by the state Building and Construction Trades Council in its meeting just preceding the state convention.

The AFL-CIO convention also voiced opposition to a proposed transmission tie between California and the Bonneville Power Administration unless Congress guarantees that California users will not be given a preference over Oregon customers and that the interchange would involve only power that is surplus to the Northwest.

Crack in Grange-Labor Front

The union decisions were at least a sizable crack, if not a break, in the historic Grange-labor alliance on power questions in the state.

At the same time, the union group adopted a resolution favoring an investigation of the large increase recently granted to Portland General Electric Co and Pacific Power & Light Co, and urged all central labor councils to work for lower utility rates. The resolution also urged that the Public Utilities Commissioner, now appointed by the governor, be directly elected by the voters.

The union actions came in the midst of a series of new and revived proposals to replace private utility service with municipal or PUD operations. Most of the proposals stemmed from the recent rate increases, which appeared to have left some of the consumers confused. The public power moves centered on four areas:

- In Astoria, a local attorney and former head of the State Fish Commission under a Democratic administration was attempting to set up a citizens committee to study PP&L's rate increase, with some prospects for an effort to set up a PUD.
- In Portland, a small group of businessmen, headed by a long-time public power advocate, was urging the City Council to take over PP&L's facilities in the city (EW, Aug 8, 1960, p 30).
- A proposal to set up a PUD in Keizer, a 6.1-sq-mile suburb of Salem, appears likely to be on the ballot this November. Petition for formation of the PUD is now pending before the Oregon Hydroelectric Commission. Most of the area and about 2,400 customers are now served by PGE.
- Another PUD petition has been filed in Lyons, a small lumbering community served by PP&L.

At the same time, the Washington Public Power Supply, sponsor of the Nez Perce Dam, has stepped up its power activities in Oregon, opened an office in Portland, and retained a full-time public relations man for the state. Twelve Oregon co-ops, PUD's, and municipals have indicated an intention to sign agreements with WPPS, providing options on power from Nez Perce in return for funds advanced for preliminary investigations and proceedings.

PUD Election Set

In coastal Tillamook County, served both by PP&L and an existing county PUD, an election will be held in September on a PUD proposal to buy PP&L distribution facilities. For some years, the private utility lines here have been duplicated by the PUD. In this area, PP&L's rates were permitted to remain competitive with those of the PUD. To avoid a costly evaluation procedure, the utility has stipulated that the price for the facilities will be $3,915,000 if the PUD proposal wins and a condemnation procedure is instituted.

No public power activity has been apparent in the southern Oregon territory served by California-Oregon Power Co. A pending COPCo rate application for a $1,280,000 annual increase in gross residential revenues has roused no interest. At the PUC hearings, only three outside people attended and no organized objection came from public power groups.

Although private power pulse feelers regard the activity as "normal election year dust-raising," and feel their position was definitely improved by the labor group action, they are keeping a close eye on developments. They point out that local voters have defeated numerous public power proposals by healthy margins in recent years.

Increases Confuse Public

Public confusion about the rate increases has been used by the public power advocates to stimulate the move to PUD's and municipals. For example, PGE and PP&L were granted rate increases in Oregon at the same time PP&L's request for a 10% increase in neighboring Washington was denied. The rate increase granted PP&L averaged about 11.5% on its Oregon business. Oregon Utility Commissioner Jonel C. Hill found this gave the company a 6.1% rate of return. By contrast, the Washington Commission found that PP&L was already making 6% on its investment in Washington.

In quoting the Washington PSC chairman that PP&L "is making a fair return and requires no increase in rates to keep it in healthy financial condition," public power advocates have left out the qualifying phrase, "on its operations within the state."

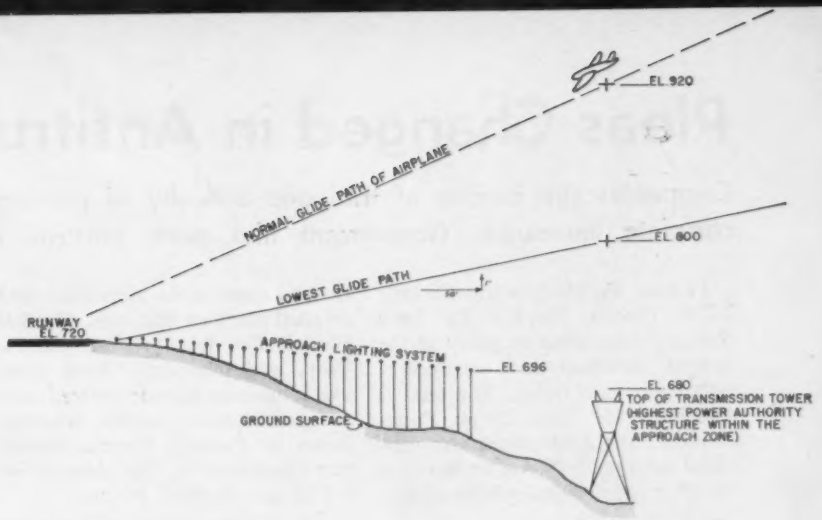
The Oregon rate increases went into effect March 24, after 15 months of investigations and hearings. PGE was granted an annual increase in gross revenues of $1,924,734 out of a requested $5,257,000; PP&L, an increase of $3,544,556 of a requested $4,668,734.

The increase amounted to about

(*Continued on page* 106)

Tower route skirting airport stirs storm as . . .

345-Kv Line Hits Right-of-Way Snags



A 345-kv transmission line that will link New York State's Niagara and St. Lawrence power projects ran into a roadblock last week when a local airport objected that the line constituted a hazard to planes and prohibited future expansion.

The contenders in the fracas were the Power Authority of the State of New York, which is building the 200-mile transmission line, and the Board of Supervisors in upstate Oneida County, where the airport is located. The Board of Supervisors was reported to be seeking an injunction to halt clearing of land and initial foundation work until the possibilities of a new route or an underground cable can be studied further.

Running between the airport and the New York State Thruway, the line is 8,000 ft from the end of the instrument runway and only 2,100 ft from the Thruway. PASNY chairman Robert Moses contends that any other route would require destruction of houses and farms, traversing a swamp, and use of sharper angles which would increase cost. He stated that 345-kv underground cable has not been commercially developed, and that losses and costs would be high.

The location proposed by the Power Authority has already been checked by the Federal Aviation Agency, which found it was not a hazard to airport operation. Since the airport is located on a plateau and the line runs in a gulley, the tops of the tower are below those of the runway warning lights, and about 120 ft below the lowest flight path permitted. Moreover, Moses contends that the topography of the land makes it impractical to expand the airport toward the line.

Cesium Cell Produces 90 Watts in Direct Conversion Test

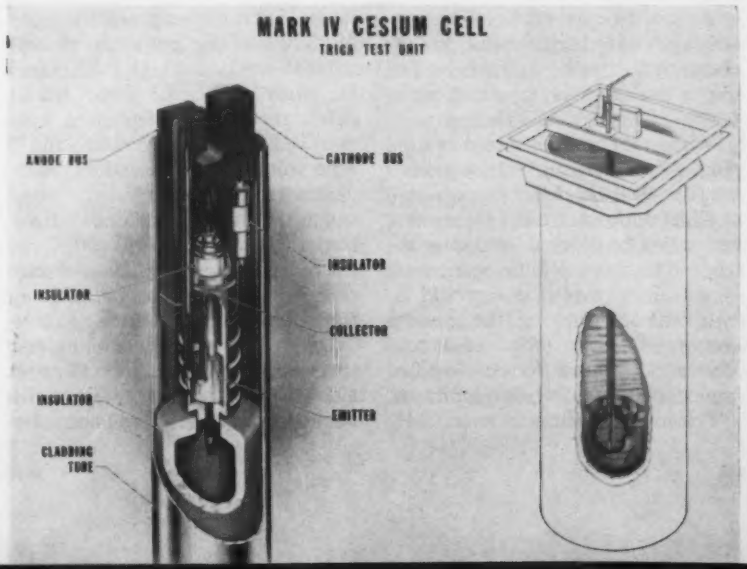
A cesium cell thermionic converter has produced up to 90 w of power directly from nuclear fission in a series of tests at the General Atomic Division of General Dynamics Corp, San Diego, Calif.

The cesium cell converter contained uranium carbide and zirconium carbide. Electrons were boiled out of the enriched-uranium emitter and captured by an electric current collector surrounding the emitter electrode. The cell reached a power density of 21 w per sq cm, delivered into an external load. Measured at a bus bar, the conversion process showed overall efficiencies up to 10% at an operating temperature of about 3,500F.

Results of the tests, conducted in the division's TRIGA reactor, were presented at the Pacific General Meeting of the American Institute of Electrical Engineers earlier this month.

The experiments are the first in a series to establish the feasibility of a nuclear-thermionic reactor system for space and land-based power applications. The tests are part of a research program supported by nine western utility companies.

The cesium cell appears to be capable of higher efficiency when its dimensions and temperatures are optimized. It also is capable of ultra-high temperature operation. No attempt was made to use waste heat rejected by the converter to further increase the overall electrical output and efficiency.



Pleas Changed in Antitrust Suit

Companies cite burden of trial and difficulty of proving complete innocence. Government files more particulars

Federal Pacific Electric Co and I-T-E Circuit Breaker Co have changed their pleas to guilty in the federal anti-trust case on power switchgear assemblies. The trial is scheduled for Sept. 19 in Philadelphia. The government also provided more information on the case by filing supplementary bills of particular last week.

In announcing the change in its plea, I-T-E said, "Further study of the amended indictment had convinced the company that the probability of establishing complete innocence or achieving other favorable outcome . . . was remote," and therefore it was in the "company's best interests" to change the plea to guilty. I-T-E also pointed out that its switchgear section producing the apparatus involved had an operating loss during the period covered by the indictment, but that this was partly due to "more than ordinany" development expenses.

I-T-E said that it originally made a *nolo contendere* plea in this case because, "it was felt that pleas of *nolo contendere* were appropriate legally and, additionally, conveyed the companies position to the general public." After the indictment was amended, all of I-T-E's pleas were changed to not guilty.

FPE Cites Expense of Trial

In announcing its change in plea, Federal Pacific pointed out that none of its officials were named as a defendant in the case and that "a trial would be expensive, time-consuming, and burdensome to the company." It also stressed the fact that it is a relatively new and minor factor in assembled switchgear.

When the new pleas were entered Aug. 16, the Justice Department's lawyer, William Maher, suggested to Chief Judge J. Cullen Ganey that sentencing be delayed until after the trial. The judge left the matter up in the air, saying that it would be "worked out" among the counsel concerned. The judge also told Maher he wanted to be "notified immediately" of any developments.

Previously, Allis-Chalmers Mfg Co and three of its individuals had pleaded guilty on this case. General Electric Co, Westinghouse Electric Corp, and individuals from those two companies have not altered their not guilty pleas. Neither Westinghouse or General Electric offered any comment on the changes by I-T-E and Federal Pacific.

The supplementary bills of particulars (which are not indictments) were in answer to motions by GE and Westinghouse for more information on the power switchgear assemblies case to help the companies in preparing their defense.

While the answer to the Westinghouse motion is in general terms, the answer to GE is more specific and spells out in detail what the government means in the indictment when it refers to "discussions" that preceded a meeting, which, the government says, was held in New York on Oct. 8, 1958 to discuss increasing the price levels for power switchgear assemblies.

Specifically, the bill says that Clarence E. Burke (GE), Fischer Black (then of Electrical World), and defendant George E. Burens (GE) had discussions in California in Sept. 1958 "concerning the desirability of arranging a meeting among representatives of the corporate defendants." Then there were discussions, the government continues, "probably by telephone, between Fischer Black and each of the following persons, in Sept. or Oct. 1958, concerning arrangements for a meeting among representatives of the corporate defendants: Harry L. Buck (I-T-E), Frank H. Roby or R. L. Bobo (FPE), defendant Burens, defendant Landon Fuller (Westinghouse), and a representative of defendant Allis-Chalmers."

The bill also states that Burens, Burke, Frank E. Stehlik (GE), and H. F. Hentschel (GE) had discussions in Philadelphia in Aug. or Sept. of that year concerning a meeting with competitors. Finally, the government alleges the Oct. 8, 1958 meeting was the subject of a discussion, probably by phone, between Burens and Arthur F. Vinson (GE) in Sept. or Oct. 1958.

Also included in the bill are references to two meetings allegedly held in 1959 to discuss the agreements charged in the indictment. These agreements, the indictment says, were that all defendants would sell power switchgear assemblies at book or list price levels, except Federal Pacific, which would be permitted to quote prices at a specified differential below the prices quoted by the other defendants.

The other agreement, the indictment charges, was for the allocation of government bid business according to the following percentages: GE 39%; Westinghouse 35%; I-T-E 11%; Allis-Chalmers 8%, and FPE 7%.

The bill says one meeting was in February or March, 1959, in New York, and was attended by Burens, Burger, Fuller, L. W. Long, Buck, and Roby. The other meeting was Sept. 22, 1959, in Philadelphia, and was attended by Burger, Fuller, Long, Hentschel, Stehlik, Buck, Bobo, and Burke.

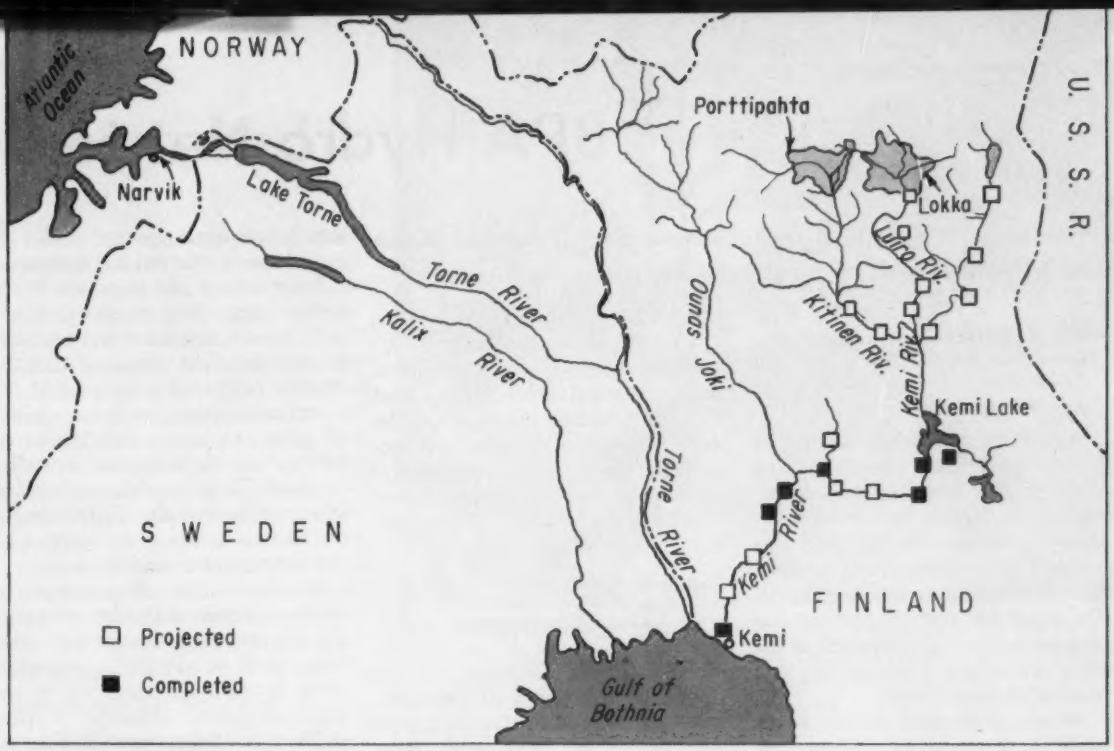
These supplementary bills of particulars follow others filed a month ago by the government. These, too, were in response to motions by GE and Westinghouse for more information on the power switchgear assemblies cases.

Top Officers Are Mentioned

In these earlier bills, the top officers of GE and Westinghouse are named as having authorized, ordered, or done the acts charged in the indictments. But the bills use the words "personally authorized or ordered" only in connection with some of the defendants already indicted or others who are not top officers in the companies.

One of the earlier bills also charges that in the summer of 1958 "Vinson authorized or directed" Burens to contact competitors to agree on switchgear assembly prices.

The government's bill of particulars adds that defendant Vinson informed Burens and Burke that he, Vinson, had received assurances from A. C. Monteith (Westinghouse), concerning cooperation by Westinghouse with respect to an agreement on such prices.



Giant Lapland reservoirs are planned as . . .

Finns Build Arctic Hydro Project

A giant Arctic hydro development that will create one of the largest artificial lakes in Europe is fuel-hungry Finland's solution to a prospective power shortage. Envisioning construction of up to 26 plants on the Kemi River and its tributaries, the plan may produce up to 5,500-million kwhr per year, about one-third of the total water power in the country. Several dams stations have been built and four more are under construction (see map above). Most of the Kemi's drainage basin lies in Lapland, north of the Arctic circle.

The project will meet Finland's power needs, expected to double in the next 10 years, until nuclear power can be justified. Because of special conditions, atomic power for industrial use may be economic in Finland before it is in other countries.

Excluding less economic fuels such as wood and peat, Finland's only natural source of energy is water power. The country has no coal or oil.

Although there is a good deal of hydro to be harnessed, notably the Kemi River, most of it is in remote spots where construction is difficult and expensive. For example, the banks of the Kemi are low and most of the population in the area, sparse though it is, is concentrated along the river banks. Since there are few lakes in this area, the river bursts its banks every year in the spring thaw. Flood water can be 40 to 50 times as great as mean water. Thus any power stations will require very strict and massive water regulation, by enlarging such lakes as there are and building artificial lakes.

First step is to dam the Kemi Lake basin to enlarge its volume to 810,000 acre-ft. This means increasing the length of the lake over 60 miles. Summer water level would then be about as high as it is in the spring floods, some 23 ft above winter low water.

Lake to Cover 112 Sq Miles

Since this alone would not guarantee enough water, reservoirs must be built in the swamps of Lapland, an area that is largely uninhabited and unsuitable for cultivation. The suggested sites for two of these man-made lakes are Porttipahta, on the upper Kitinen River and Lokka on the upper Luiro River. The first of these would cover an area of 112 sq miles and hold 1,620,000 acre-ft of water. The Lokka Basin, site of the biggest swamp in Europe, would be about 154 sq miles and hold another 1,620,000 acre-ft of water. Construction at Lokka is scheduled to start in 1961; at Porttipahta, in 1963. More reservoirs are planned but exact sites and sizes have not been set.

Another hydro project now being planned is in the watershed of the Tornio (Torne in Swedish) River, which forms the boundary between Sweden and Finland. The two countries are planning joint exploitation of this system and have an agreement on export of power.

A visionary scheme for this river and the neighboring Kalix would dam both and store the water in giant artificial lakes in Lapland. The water would be led by canal and tunnel to Lake Torne in Sweden. From there it would be led by tunnel past a huge joint Scandinavian power project and then, by tunnel again, across a narrow strip of Norwegian territory and into the Atlantic. The overall fall head would be 1,132 ft and the annual energy output, more than 7,000 million kwhr, equivalent to all existing Finnish power stations.

BPA Hydro Net to Be

Load-frequency control will govern five Columbia River powerhouses; division of load still preset manually

ARDEN R. BENSON, Electrical Engineer, Branch of System Operations and Power Resources, Bonneville Power Administration, Portland, Ore.

Automatic centralized control of federal generating plants on the Columbia River will be started next year by Bonneville Power Administration. Consoles in the Administration's dispatching center at Portland, Ore., will control five plants. The need for such equipment has become increasingly apparent as the BPA system has grown in size and number of connections.

As a first practical answer to the problem of automatic control, frequency regulation was assigned years ago to the federal system, while neighboring utilities controlled power flow on their important tie-lines. Since then, study of interconnected system operation by utility and manufacturers' engineers has resulted in new understanding and newly available control equipment.

Tie-line bias control was developed—a means by which each utility can regulate for its own load fluctuations while contributing its share to regulation of system frequency. Some of the non-federal utilities in the Northwest Power Pool have adopted tie-line bias control in its most modern form.

Problems Cited

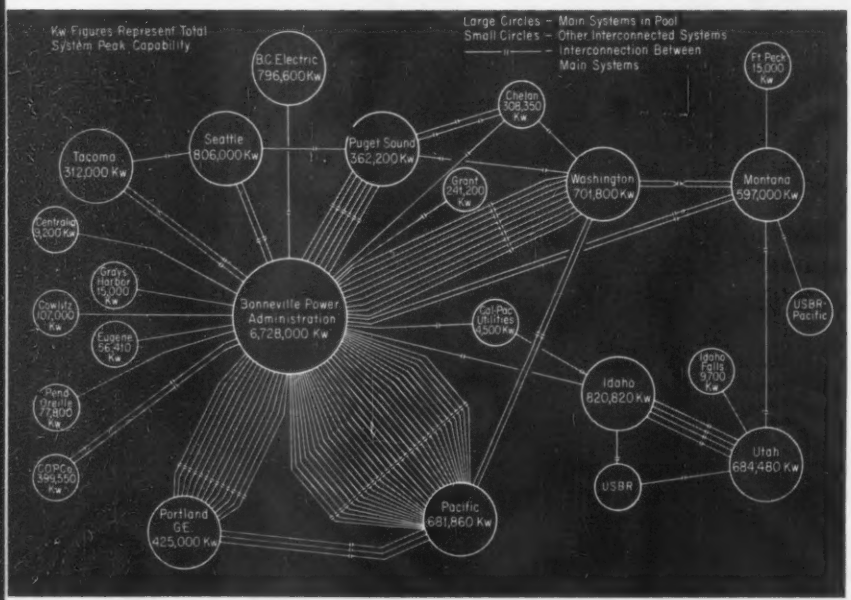
In 1956, BPA engineers undertook a new study of the specific problems in the Northwest. Similar studies by the Corps of Engineers and the Bureau of Reclamation were coordinated in 1958 with BPA studies. The present specifications for automatic centralized control were the result.

A number of unusual problems were involved, not all of which have been solved. These arise from the large geographical spread of the controlled area, the fact that little correlation exists between specific generation and specific load areas, and the circumstance that almost all generation in the Pacific Northwest —both federal and non-federal—is hydroelectric. The Bonneville Power Administration transmission system presently connects directly to nine other utility systems at 92 points, as the diagram below shows. Of these, 14 are at 230 kv, 44 at 115 kv and the remainder at 69 kv or lower. A substantial network of interconnections also exists among the various non-federal members of the Northwest Power Pool.

Because almost all generation in the interconnected systems is hydroelectric and because extreme variations exist in regional geography, there is seasonal variation in individual system capacity. A particular utility may be operating in its season of inadequate water while water may be spilling over the dams in another part of the region. Overall economic operation of the Northwest Power Pool indicates that system load fluctuations in an area of scarce water resources should be regulated by swinging the generators in another area where water is plentiful. The load-frequency control equipment will provide for this type of operation.

The load-frequency control equipment planned for the federal plants on the Columbia River system will initially control Bonneville, The Dalles, McNary and Chief Joseph powerhouses (all operated by the Corps of Engineers) and Grand Coulee powerhouse (operated by the Bureau of Reclamation). These powerhouses will have a combined nameplate rating of 5,637 Mw. Each will perform its assigned share of regulating system frequency and—whenever tie-line bias control is selected—maintaining net interchange power at its scheduled value. The present program may be regarded as an initial control installation, which can be expected to grow in effectiveness and degree of automation in future years.

The control naturally divides itself into two functional parts, and two separate consoles will be provided. These are a System Deviation Console and a Generator Allocator Console.



MANY INTERCONNECTIONS among the Northwest Power Pool utilities and the Bonneville Power Administration emphasize their interdependence

Automated

The System Deviation Console permits the operator to select manual or automatic operation. If the console is on "automatic," the operator can select the desired type of operation, such as "frequency control," "tie-line bias," or either of these with automatic correction for cumulative error in system time. System deviation — the difference between scheduled and actual power generated—will be determined from a signal proportional to the incremental generation requirement in megawatts and will be apportioned among the controlled powerhouses in the Generation Allocator Console.

BPA SYSTEM CONTROL CENTER displays a grid supervisory control diagram and, in the middle of the chart recorders, an annunciator board for the main grid shown on the map below. Control consoles will be added

Generation Set Manually

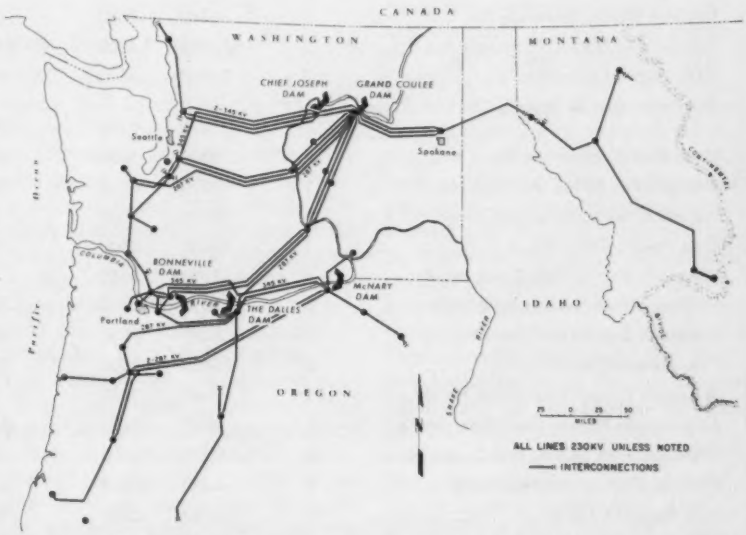
The Generator Allocator will provide manually set generation schedules for each controlled power source in terms of total controlled system generation. Each of these schedules, set by means of five dials, will span the range from zero to maximum generation at the powerhouse. Because the mathematical problem of optimum generation in a series of hydraulically coupled powerhouses has not yet been solved, no automatic computer setting of these generation schedules can yet be applied. For the present the dial settings will be based on engineering judgment and experience.

A continuous station-deviation signal based on the difference between actual and desired generation at each powerhouse will be used to provide reset control of a locally selected set of generating units at each plant. Within each powerhouse, the main generating units are essentially identical.

In addition to reset (sustained) control, proportional (fringe) control will be applied to two generating units. One of these, at Grand Coulee, is driven by a Francis turbine, and the other, at McNary, has a Kaplan turbine. The proportional control installation will be installed partly for evaluation. It is not yet known how effective such control can be when applied to large hydroelectric generators.

The equipment will be designed to be fail-safe. Most control malfunctions will cause generation to remain at the last valid level. Alarms will sound in case of excess station deviation, excess system deviation or excess frequency deviation. As backup protection in case of extreme variation in system frequency, the automatic control will shut itself off, allowing free governor operation in all plants until local frequency control can be established.

Plans for the future include an automatic optimum water-use computer to set generation schedules, and increasing automation of the hydrologic data-handling and stream-flow forecasting process. The forthcoming initial installation will constitute a major step in the increasing effectiveness of the Columbia River power system.



BONNEVILLE MAIN GRID transmission system covers a large area. Load-frequency and tie-line bias controls will regulate the complex system

Where Do Boiler Feed-Pump

Most units tailored to the overall plant cycle; full-capacity feed pumps favored for plants up to 350 Mw

H. A. MAYOR, Product Application Engineer, Small Steam Turbine Dept, General Electric Co, Fitchburg, Mass.

The return to turbine-driven boiler feed pumps for power plants has spurred a variety of ways for integrating this unit into the main plant cycle. After operating experience of up to three years with such installations, these factors can be denoted as earmarks:

Custom design of the boiler feed-pump turbine's thermal components has been the rule and probably will continue to be. This integration of the feed-pump turbine's operating cycle with the thermal characteristics of the overall plant cycle gives optimum balance among investment costs, net heat rates, and economy of operation.

Primary steam supply to the feed-pump turbine is extracted at some intermediate pressure in the steam cycle. Full boiler pressure is not used, except as described later in this article. Today's predominant reheat cycle has favored the new concept of steam extraction from the cold reheat line. This is by far the most commonly chosen extraction point.

Steam for feed water heating in the majority of installations is extracted from the feed-pump turbine instead of from the main turbine for one, two or three intermediate-pressure heaters.

Full-capacity feed-pump-turbine sets have been favored for units to 350 Mw; for larger units, half-capacity feed pump units are usual.

41 Boiler Feed Pump Turbines
(Listed in order installed since May, 1957)

				Boiler Feed Pump Turbine Specifications			
				Steam Conditions			
				Cold Reheat			
Utility and Station	Number of Feed-Pump Turbines	Rated Input, Hp	Rated Speed, Rpm	Pressure, Psia	Temperature, F	Exhaust Pressure, Psia	Rated Output, Mw
Appalachian Electric, Glen Lyn No. 6	1	6230	5610	536	707	112.5	225
Ohio Power, Muskingum No. 3, 4	2	6230	5610	536	707	112.5	225
Appalachian Electric, Clinch River No. 1, 2	2	6230	5610	536	707	112.5	223
Ohio Power, Kammer No. 1, 2, 3	3	6230	5610	536	707	112.5	225
Cleveland Electric, Avon No. 8	2	7710	7575	740	692	8.0	215
Niagara Mohawk, Huntley No. 67, 68	3	6800	7000	465	633	40.0	200
Niagara Mohawk, Dunkirk No. 3, 4	2	6800	7000	465	633	40.0	200
Potomac Electric, Dickerson No. 1, 2	2	6240	7000	....	...	20.0	175
Philadelphia Electric, Eddystone No. 2	2	4500	4800	1050	730	348.0	325
TVA, Widows Creek No. 7	2	10000	6600	502	645	35	500
Baltimore Gas & Electric, Chas. P. Crane No. 1	1	7290	6310	597	690	55	183
Union Electric, Meramac No. 4	1	8800	5650	525	670	111	300
Metropolitan Edison, Portland No. 2	1	9800	6650	500	645	37	225
Indiana & Michigan Electric, Breed No. 1	1	19600	3600	94	757	0.7	450
Ohio Power, Sporn No. 5	1	19600	3600	94	757	0.7	450
Wisconsin Electri , Oak Creek Nc. 5	1	8180	3650	92	584	0.7	250
Virginia Electric, Possum Point No. 4	1	8650	5560	581	650	35	200
Cleveland Electric, Lakeshore No. 18	2	5190	3800	196	775	1.0	225
TVA, Paradise No. 1	2	15700	5500	502	645	35	600
Wisconsin Electric, Oak Creek No. 6	1	8180	3650	92	584	0.7	250
Appalachian Electric, Clinch River No. 3	1	6230	5610	536	707	11.5	223
Commonwealth Edison, Will County No. 4	3	9700	5210	460	595	75	500
Potomac Electric, Dickerson No. 3	1	6240	7000	....	...	20.0	175
TVA, Paradise No. 2	2	15700	5500	502	645	35	600
Indiana & Michigan Electric, Breed No. 2	1	19600	3600	94	757	0.7	450

Turbines Stand Today?

Boiler feed pump turbine drives are not limited to any particular arrangement. The steam turbine's inherent flexibility permits the designer to select for a feed-pump turbine operating characteristics that adapt it to any normal power plant cycle. The speed is chosen to meet the desired pump characteristics and the pumping load. The number of pressure stages, physical arrangement of the turbine wheels and the energy distribution through the turbine are selected to match the cycle characteristics and the pump characteristics to the power needs. A boiler steam supply is usually incorporated to augment the normal steam source under overload, light load and emergency conditions.

In the usual design, the feed-pump turbine takes its steam from the cold reheat line and exhausts to a deaerating heater (EW, March 17, 1958, p 68). Steam is extracted, in turn, at one, two, or three points from the feed-pump turbine for feed-water heating. This concept makes corresponding extraction points in the main turbine unnecessary. For a station rated at 2,000 psig initial pressure, a pressure ratio across the feed-pump turbine—between turbine inlet and exhaust—of 6:1 to 8:1 gives adequate energy for feed water pumping over a reasonable range load. For a 2,400-psig drum-type boiler system, a pressure ratio of 8:1 to 10:1 has been found suitable in most cases.

In both arrangements, the deaerating heater receiving the turbine exhaust requires additional steam from an extraction point on the main turbine to meet certain loads. As long as steam is bled from the main turbine as needed to meet the heater requirements, the pressure ratio across the feed-pump turbine remains essentially constant, because its inlet and exhaust pressures are fixed by pressures in the main turbine.

Main Steam Drawn On

As load on the main turbine, hence feed-water requirement, falls off, load on the feed-pump turbine decreases too, but not in direct proportion to the feed-water flow because of reduced pump efficiency at partial loads. A larger and larger percentage of the cold reheat steam is required. This percentage increases and the cold reheat pressure decreases until the steam flow demanded by the feed-pump turbine exceeds the low-pressure nozzle area capability. Below this load point, high-pressure steam from the boiler is admitted automatically through a separate control valve and separate nozzle arc to carry the pumping load. This point is determined by pump characteristics, feed-pump turbine design, main-cycle characteristics and margins incorporated by the system designer for the feed pump and for boiler regulation.

A second cycle incorporates a condensing, non-extracting turbine drive for the feed pump and a steam path paralleling the low-pressure elements of the main turbine. This arrangement yields a good heat rate, especially in case the annulus area of the last stage in the main unit is limiting and there is an exhaust loss that can be reduced by decreasing the last-stage steam flow. A condensing-turbine feed-pump usually takes steam from the crossover to the low-pressure turbine and exhausts to a separate condenser. This reduces the exhaust flow on the main turbine to improve the exhaust loss. With this arrangement, also, supplementary main steam must be admitted at light loads.

Half-Size Pumps in Big Plants

There are many possible variations on these two basic cycles. One variant of the first cycle omits the exhaust heater connection to a main-turbine extraction point. In order to maintain feed-pump turbine exhaust pressure, a bypass is put around the next lower heater in the cycle. Another design incorporates an all-closed heater cycle.

To date the greatest number of these installations have one full-size unit for each main turbine-generator. Half-capacity pumps are more prevalent for main units larger than 350 Mw. There are good reasons for this trend. The pumping power, because it is a function of main-unit rating, increases in the same proportion. The feed pump size is limited only by design practice and by reluctance to apply components without a considerable background of experience. In these large sizes, there is no appreciable difference in thermal efficiencies of the feed-pump turbines or in the mechanical efficiencies of the pumps between half and full-size equipment. Moreover the flexibility of operation with two separate pumps, one of which can carry the boiler feed demand at somewhat more than 50% main-unit load, usually justifies the additional investment required.

Main Unit Specifications

Steam Conditions		
Boiler Pressure, Psia	Throttle Temperature, F	Reheat Temperature, F
2015	1050	1050
2015	1050	1050
2015	1050	1050
2015	1050	1050
3500	1100	1050
2415	1050	1000
2415	1050	1000
2415	1050	1000
3515	1050	1050/1050
2400	1050	1000
2415	1050	1000
2015	1000	1000
2415	1050	1000
3500	1050	1050/1050
3500	1050	1050/1050
....	....	....
2415	1000	1000
2415	1000	1000
2415	1050	1000
2415	1050	1000
2015	1050	1050
2415	1000	1000
2415	1050	1000
2415	1050	1000
3500	1050	1050/1050

New-Customer Procedure

Reorganization cuts San Diego's time from months to days, eliminates nearly all costly rush jobs on minor orders

F. E. EDWARDS, Director, Customer Extension Planning Department, San Diego Gas & Electric Co, San Diego, Calif.

The new-customer-job procedure in use for the past six years at San Diego Gas & Electric Co has produced gratifying results: It has reduced the processing time from months to days, eliminated virtually all the costly "rush job" problems on minor customer orders, and vastly improved customer relations. These were accomplished without adding manpower or equipment.

Administered by the new Customer Extension Planning Department, the system went into effect June 1, 1954, following six months of organization and training. These benefits are specific:

- Time for servicing customers is a third of what it had been.
- Customers urgently needing service get it in days instead of weeks.
- Paper work has been cut 82%, bringing savings in dollars.
- Customer complaints have been drastically reduced.
- Costly "rush job" procedure on small jobs has been virtually eliminated.

Population Explodes

At the close of World War II, the San Diego utility faced an exploding population, coupled with a staggering backlog of deferred maintenance. As customer orders were processed according to application date, a customer had to sign well in advance of starting his project. Almost every job reaching construction carried a "rush," so that crews were daily crossing paths on "hot" orders.

Convinced that changes were necessary, management called in a consulting firm, whose investigation disclosed these situations:

- Forms were outmoded.
- Much accumulated data were useless.
- An average order, no matter what size job, took 84 pieces of paper.
- When a tremendous work load was superimposed on a paper-choked routine, as much time was spent in explaining delays as in accomplishing the work.
- More than 90% of new-customer orders were less than $1,000 in value, the average being less than $500.
- Company rules required that lines be extended wherever the load would justify the footage of line, yet each job required a new-business estimate approved by a vice president.

Trained in All Problems

The Customer Extension Planning Department was formed with personnel trained to handle all problems encountered in customer orders. Basically, its operation consists of placing one man, a planner, in an assigned area where he has authority to handle all customer contacts relative to new service, change in service, or minor maintenance.

A new operation manual brings together the previously unwritten rules of the various departments involved. By consulting it, the planner can undertake sales, accounting, engineering, and construction details as needed without the aid of other departments unless a specialist is needed. A vice president's signature is no longer required on orders less than $1,000.

Occasionally a planner encounters a sales situation taking more time than he can spend. Then a note to the Sales Department directs a salesman-specialist to the particular customer. After load has been fully developed, the planner is notified of the equipment to be served and proceeds with the order preparation.

If it appears to a planner that the job will serve a load of questionable permanency, he calculates the cost of installing and removing the line and secures payment for the whole operation. To eliminate later connection of a permanent load to temporary lines, the pole is tagged with a "T" tag to alert other field men. As soon as a temporary customer discontinues service, the planner is notified and initiates removal of the line and the line's adjustment.

Recording Speeded

All work done is recorded and posted on record cards. Job cards, consisting of a series of stubs detachable by various departments as each completes its part of the job, are returned to a central control desk where progress records are maintained. These cards are tallied each month and an accurate count secured on footage of line installed, load connected, and the number of customers. Customers seeking information on job progress secure it within minutes from the master-control card file.

An analysis of the job cards gives the time taken by the planner from application date until the order is issued. This gives a standard useful in determining whether in an area additional help is needed due to unusual work load. Reserve personnel move in on "hot spots." Advance information is available from the job cards so that the Construction Department can plan its work load for the next 60 to 90 days. This is helpful in scheduling crew vacations, as well as large jobs.

Experience Stressed

When a construction foreman encounters an order that cannot be executed because of an error in material requirements or sketching, he reports it to a Planning Department supervisor. This furnishes a check system so that, when the planner needs additional training, it can be given.

Planners often discuss with general line foremen the operations in the field to learn details for the preparation of unusual orders. Such discussions have produced a tremendous gain in job efficiency.

Cuts Job Time

At present, the Construction Department has the time for job scheduling, the costly "rush" procedure on the smaller customer orders having been virtually abolished. The shifting of order backlog from the commercial offices to the Construction Department has brought greatly increased efficiency in crew scheduling and line construction.

To minimize interdepartmental misunderstandings, the new department is under the vice president who supervises construction also. The manager-engineering has direct supervision over the director of customer extensions and coordinates operations of the engineering phases.

The functional control of district operations is retained by the director, district managers having administrative control of planners assigned to them. Districts with more than four planners have a senior planner.

Experiences Varied

Adequate training and successful operation go hand in hand. Men taken into this work come from various departments — accounting, line construction, engineering, and sales. To bring their capabilities to a common level, the program embraces all phases of planning.

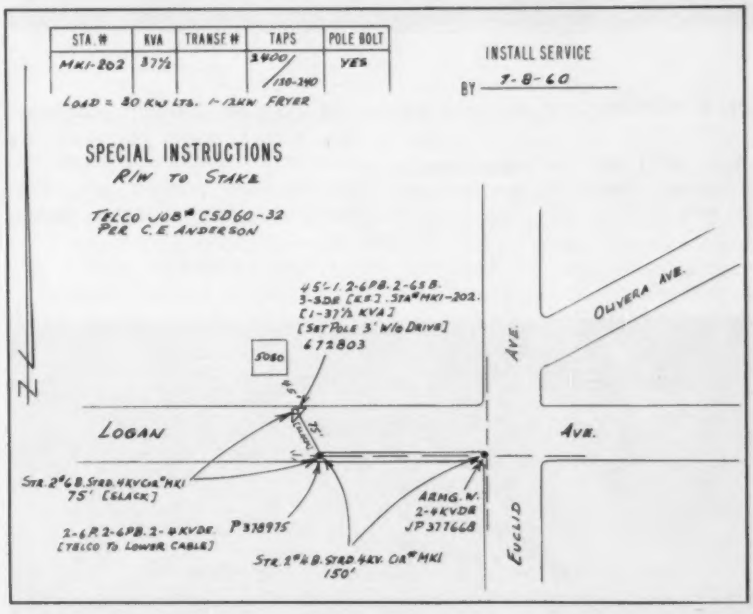
Under supervisors and senior planners, the trainee is given 200 hr of classroom work, covering 48 subjects. Frequent field trips give him opportunities for first-hand observation and for obtaining material for class discussion. A trainee is "walked through" the steps of order writing by a senior planner to acquire good working habits.

Near the end of his training, the future planner has an opportunity to spend a few days with a line crew and with a service and meter crew. There he sees how time can be lost through a poorly prepared order. An examination composed of 200 questions winds up the instruction.

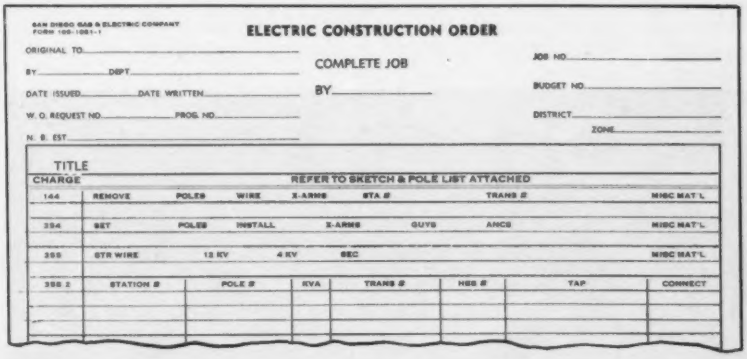
Then follow 60 days of field operation on minor jobs, after which the new planner gets a review course. It takes about a year of supervised work before he can be turned loose in his own assigned area. For three or four years, he needs only intermittent supervision. To keep abreast of changing conditions and provide planners with information on the latest techniques, training classes are held as needed. Between such meetings, information on changing procedures is sent to planners by letter.

But the planning manual is the key to successful, uniform field operation. Staff personnel revise the manual sheets and see that up-to-date information is available to planners.

In general, results have exceeded expectations. Although a planner has to be a combination engineer, salesman, accountant, and public relations man, suitable personnel have not been difficult to obtain.



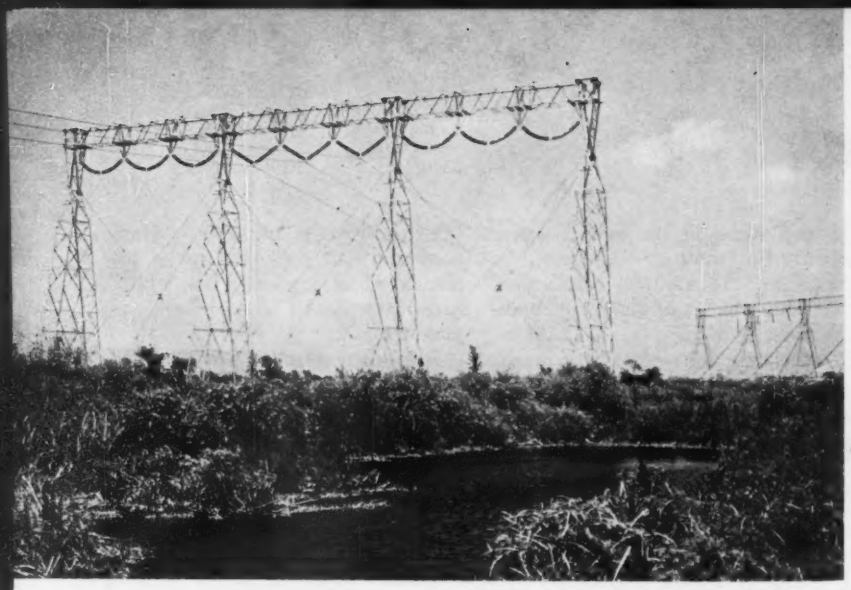
TYPICAL CONNECTION involves few poles, wire spans, and transformer installation. New San Diego G&E Co job-handling procedures save on such jobs


SAN DIEGO GAS & ELECTRIC COMPANY
FORM 100-1001-1
ELECTRIC CONSTRUCTION ORDER
ORIGINAL TO
BY DEPT
DATE ISSUED DATE WRITTEN
W. O. REQUEST NO. PROG. NO.
N. B. EST.
COMPLETE JOB
BY
JOB NO.
BUDGET NO.
DISTRICT
ZONE
TITLE
CHARGE
REFER TO SKETCH & POLE LIST ATTACHED
144 REMOVE POLES WIRE X-ARMS STA # TRANS # MISC MAT'L
394 SET POLES INSTALL X-ARMS GUYS ANCS MISC MAT'L
395 STR WIRE 12 KV 4 KV SEC MISC MAT'L
395.2 STATION # POLE # KVA TRANS # HSE # TAP CONNECT

CONSTRUCTION ORDER FORM is shown in part. Such forms along with work sketches are among the instrumentalities employed in speeding minor jobs

Transmission

7½-mile, 230-kv line, partly operating now at 138 kv, knits Port Everglades Station into the Florida P&L system

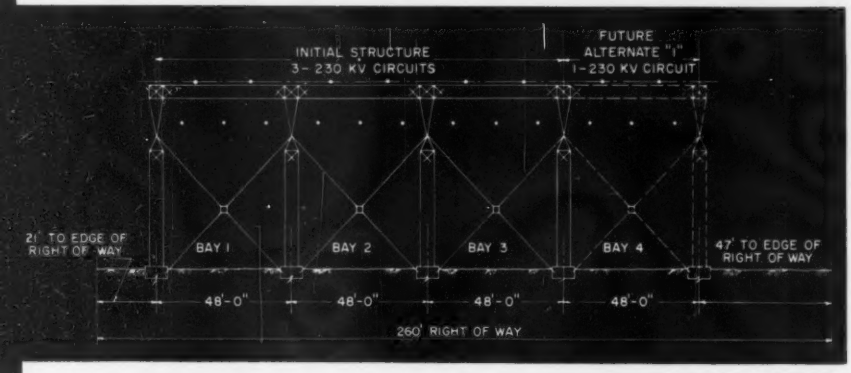


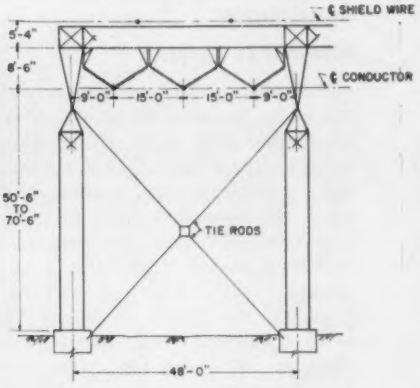
NEW 230-KV LINE from Port Everglades Station, already operating at 138 kv, is shown here with center-circuit conductors strung between the foreground tangent structure and an angle structure in right background

G. R. LATHAM, Chief Structural Engineer, and

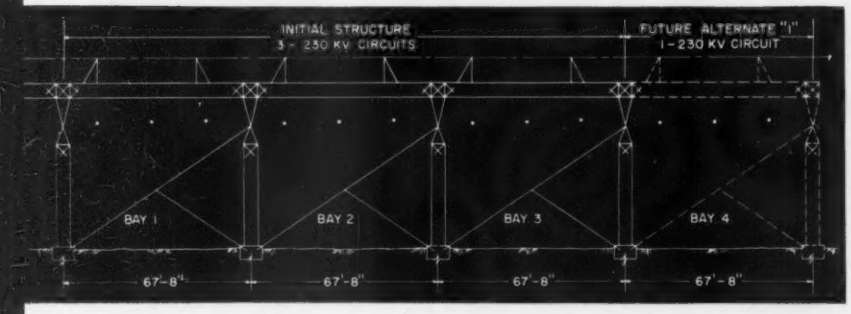
T. C. HOYT, Electrical Supervising Engineer, Ebasco Services Inc, New York, N. Y.

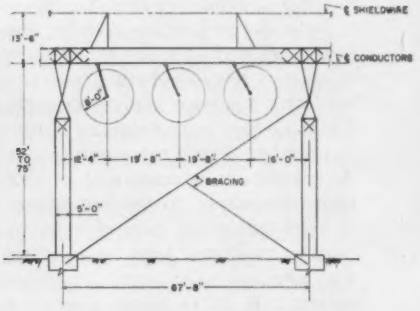
A 7½-mile, 230-kv transmission line, three circuits of which are being installed with full 230-kv insulation, will connect new Port Everglades Steam-Electric Station with the Florida Power & Light Co's system at Lauderdale Station. As designed by Ebasco Services Inc, the line will operate initially at 138 kv and later at its rated voltage.





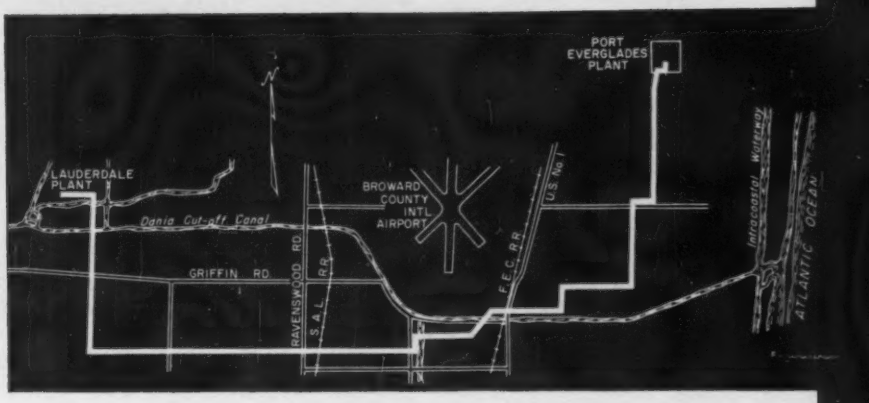
TANGENT STRUCTURES were designed to meet the exigencies of the tortuous 260-ft-wide right-of-way which traverses expensive Florida real estate, as well as for withstanding Florida hurricane winds of 150 mph in their seasons





ANGLE STRUCTURES have the dimensions given above. They have four 67-ft, 8-in. bays, the details of which are shown at the right. Initial structure has only three of the bays, the fourth to be added sometime in the future

Designed for Hurricane Winds



ALIGNMENT contains ten 90-deg and two 55-deg angles and one 15-deg angle, the line traversing many roads, pole lines, railroads, canals and US Highway No. 1

This line follows a tortuous 260-ft right-of-way through expensive Florida real estate. For a small part of the distance, however, it is on a 200-ft right-of-way. The design calls for either four 230-kv circuits, or for three 230 and two 138-kv circuits. The circuits' design complies with the National Electrical Safety Code and they are being built to withstand 150-mph hurricane wind loading.

Preliminary studies and discussions between the utility's and consulting engineers determined the following:

1. The most economical structures would be steel rather than wood or concrete. Florida P&L has made an advantageous steel commitment abroad.

2. Fog-type insulators and copper conductors were specified by the utility for locations near the ocean having salt-laden air.

3. Because ACSR could be used economically away from salt contamination, conductors were fixed as 900-MCM copper and 1,431-MCM ACSR.

4. There would be two ⅜-in. EHS galvanized steel shield wires for each circuit.

The alignment has ten 90-deg angles, two 55-deg angles, and one 15-deg angle. The line crosses many roads, low-voltage and telephone lines, two railroads, four canals, and the main north-south road in Florida, US Highway No. 1, where line height is restricted by the flight path of Broward International Airport. Ground conditions are poor, largely mangrove swamp and meadowland of low elevation often flooded during the rainy season.

The line was designed to withstand 150-mph hurricane winds with a pressure of 100 lb per sq ft on flat surfaces and 60 lb per sq ft on the projections of cylindrical surfaces. On the basis of the economics and the structural sufficiency of the conductors, tower design was not based on broken-conductor or shield wire conditions with maximum wind loading.

Overload Factor Is 1.1

For the hurricane condition, a minimum overload factor of 1.1 was specified for the steel structure design. Typical structures were tested to destruction to give assurance that they would develop the required capability. Foundations have an overload factor of 1.25 based on the 150-mph hurricane condition. There are 66 structures in the line, and the ruling span is 700 ft.

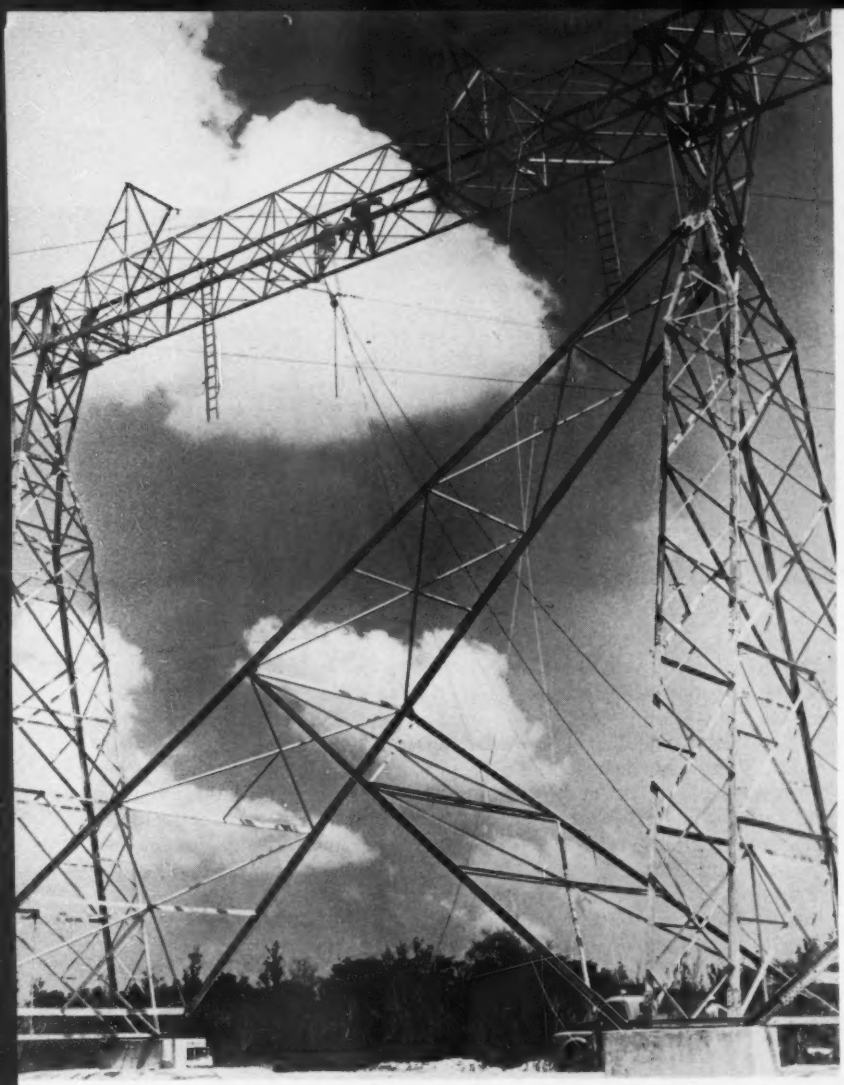
The conductors are 1,431-MCM 45/7 ACSR except for about three miles at the Port Everglades end, where they are 900-MCM 37-strand copper to resist sea-air corrosion.

Minimum electrical clearance between conductor and structure is 93 in. (about 1,400-kv impulse) under normal operating conditions of no wind at 60F. For tangent structures, the conductors are suspended on two strings of 15 fog-type (15,000-lb M&E) insulators yoked in a "vee." This arrangement gives minimum structure width, permitting maximum use of the limited right-of-way. For the angle and dead-end structures, the strain assembly is 20 EHS (36,000 lb M&E) insulators in a single string. The final two spans into Lauderdale switchyard are copper conductor.

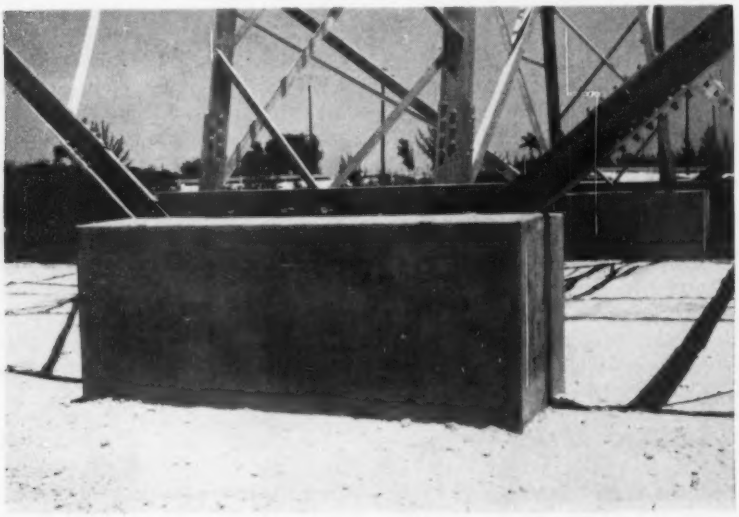
Each circuit is shielded by two ⅜-in. EHS seven-strand galvanized steel wires. The support detail eliminated threading shield wires through the truss, thus affording shielding angles of 20 deg for the outside conductors and 40 deg for the center conductor, except where the aircraft flight path restricts the height.

A unified steel structure with 48-ft normal bay spacing was the design selected. These structures were designed not only for the usual longitudinal and transverse wind conditions, but also for diagonal wind because of the large exposed area of the conductor-supporting truss. The diagonal bracing system between towers transfers the large transverse loads to the foundations, thus minimizing vertical reactions. Separate stub anchors transfer the load as low as practicable to reduce the overturning moment on the footing. Legs, chords, and other high-stressed members are high-strength steel. Structure heights from ground to conductor are 37 to 78 ft.

One bay each of a tangent and a 90-deg angle structure were tested to failure at the fabricator's plant, both structures proving satisfactory and developing an overload factor of about 1.3. Ultimate strength tests were made on turnbuckles, diagonal



DIAGONAL BRACING is used to stiffen this angle portal in the 230-kv transmission line. It transfers large transverse loads to the concrete foundations



MASSIVE FOOTINGS on concrete piles were developed for anchoring the angle towers in the sandy soil. Economy and easy construction were considered

tie rods, insulator yoke plates, and bolts, and physical tests were made on all materials during fabrication. Representative structures were shop assembled for checks on fit-up, and no difficulties were experienced in the field erection.

Test drillings at representative locations revealed that the ground varied from porous lime rock to sand with a muck cover and that the ground-water level was generally high. Ground elevation varied from −1 to +13, most of it being between elevation +2 and 3. Local codes require that all roads and building floors have a minimum elevation of +5. Accordingly, the footing top was set at minimum elevation +7 to allow for possible future land fill. A 14-ft access and service road with turnouts to each structure was built before line construction.

Buoyancy Considered

Several foundation designs were investigated to determine that best able to withstand the large uplift and shear forces. Buoyancy was considered because of high ground water and flooding. The design selected has concrete footings with batter piles on a 4 to 1 minimum slope. This was the most economical design, could be constructed speedily, and has the required capacity.

In a check on footing performance and actual capacity, two representive footings constructed on the right-of-way were tested. One footing has precast piles; the other, cast-in-place piles. Backfill was placed around them and horizontal shear loads in conjunction with uplift loads were applied. Both footings withstood the tests very satisfactorily, deflections being acceptable.

On the basis of lowest bid, prestressed 12-x-12-in. precast concrete piles were selected. Approximate pile lengths were determined by advance drilling at each structure site. The 5,000-psi, high-early-strength concrete piles were steam cured.

The piles drove excellently, and spalling was very minor even when a pile was driven to refusal. Piles were required to have a minimum embedment of 25 ft and a resistance of 40 blows for the last 3 ft to provide the required skin friction for uplift.

Before and after studies at garment plant show new lighting . . .

Boosts Revenues 44%, Speeds Slow Producers

Concrete evidence that better lighting pays is a 44% increase in average gross revenues at Don Martin Sportswear Co, Los Angeles, since the installation of a modern lighting system. The increase was revealed by a six months "before and after" study by the company, a manufacturer of women's sportswear for large clothing chains. Moreover, cost of energy for the new 100-foot-candle lighting was only 0.3% of the additional monthly increase. And the total cost of the new installation was paid off in 38 days, based on a 5% net of the gross increase.

Equally important were the large increases in individual piecework production. Accurate records, comparing the three months preceding installation with the three months following it showed:

- The top producer in the factory increased her output 15% with the improved light.
- A high average producer raised her production 13%.
- A low average producer stepped up her production 45%.
- The employee who had previously been the slowest and least competent in the plant jumped her production 164%.

Before the change, the slowest employee's output was ⅓ that of the best producer. After the change, her production was 72% of the best employee. Average increase of the four tested employees was 38%. The results indicated that although good lighting is most effective with the visually handicapped, it increases efficiency even among those with perfect vision.

Since the company had a backlog of orders during the entire period, general business conditions or seasonal slack periods had no effect on the results. No other change in working conditions or physical facilities was made during the test period.

Decline in accidents has been even more spectacular than the growth in production. Before the change, the average ratio was 2.5 accidents per month. A majority of these were needle punctures causing temporarily impaired fingers. In the three months with the new lighting, the factory had only one accident, a back injury caused by heavy lifting.

What about morale and absenteeism? According to the company, complaints from employees melted to nothing. Absenteeism, formerly high, showed a marked drop, and other personnel problems dwindled to a negligible low. Morale of the girls showed a complete metamorphosis, from marked dissatisfaction to a harmonious, cooperative working team.

Still more benefits are in prospect. The company expects insurance rates to fall in ratio to the reduced accidents. And the improved morale should help reduce labor turnover in the plant.

The company's progressiveness is reflected in its rapid growth and success. Starting from scratch two years ago, the company has grown from five operators to 45, with prospects of further growth in the immediate future. The owners consider the increased production resulting from improved lighting to be largely responsible for this rapid growth.

Heating Cable Improves Temperature Control

HAROLD M. DENISON, Industrial Consultant, Kansas Gas & Electric Co, Wichita, Kansas

Increased safety, improved temperature control, and lower operating costs are the result of replacing steam tracer lines with electric heating cable for benzene transfer pipes at the Vickers Petroleum Co's refinery in Potwin, Kansas.

The accurate temperature control inherent in electric heat makes it easy to keep the benzene in a liquid state – between its 42 F freezing point and its 95 F boiling point. The pipes are always loaded with benzene, which does not move except when loading tank cars or truck tanks.

If the benzene is in a vapor state when it is transferred from vessels or tanks, the pumps will vapor lock. On the other hand, if it has solidified, it will not flow. It is also very desirable to keep the benzene in a liquid state when it is standing in the pipes.

With the copper steam tracing, there was very little control over the temperature. Unless someone constantly adjusted the steam flow, the benzene would vaporize. Moreover, the steam had to be turned on when the benzene began to freeze in the fall and left on until all danger of freezing had passed in the spring. The steam was trapped and the condensate spilled over into a waste water line.

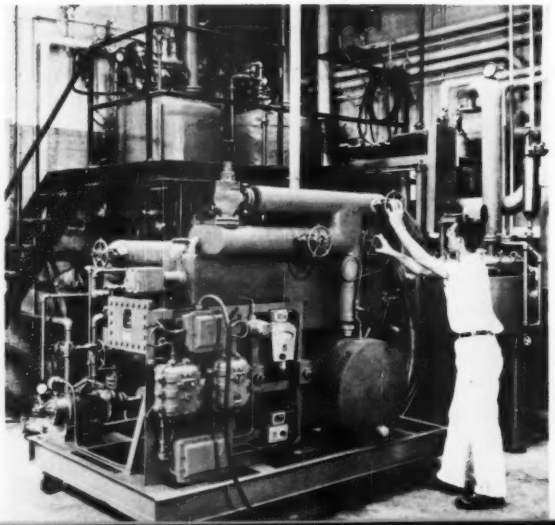
In this climate, there is a wide variation in temperatures from day to day. With the heating cable, a controlled adequate temperature is automatically maintained by a thermostat. Now heat will be supplied only when necessary, materially reducing the operating costs.

Steam Tracer Line being taken out of service
Covering removed prior to installing cable
Cable installation and Method of Energizing
Completed Line

STEAM TRACERS WERE TAKEN OUT of service and their covering removed. Heating cable was installed, with insulation over it

The new installation includes three 3-inch pipes, each 1,000 ft long. A single cable, producing 10 watts per ft – 30 kw total – was installed along the pipes, and covered with an inch of insulation, as indicated at the right.

Versatile Heater Helps Pilot Plant Studies



A portable electric heating unit that permits high boiling materials to be distilled at low jacket pressures is being used in the pilot-plant process development division of Ciba Pharmaceuticals in Summit, N.J. Previously, high temperature reactions were a problem because the process steam pressure for such reactions is higher than the 15 psig rating of the reaction kettles. The portable heater keeps reaction pressures down to one or two psig at 600°F by using a low vapor pressure Mobiltherm heat transfer fluid to heat the jacketed reaction vessels. Mounted on wheels, the 15-kw resistance heater can be moved from building to building and easily connected to any of the 50-gallon reaction vessels used in these studies. A canned rotor centrifugal pump circulates the hot Mobiltherm heat transfer fluid at 50 gpm against a 30-ft head.

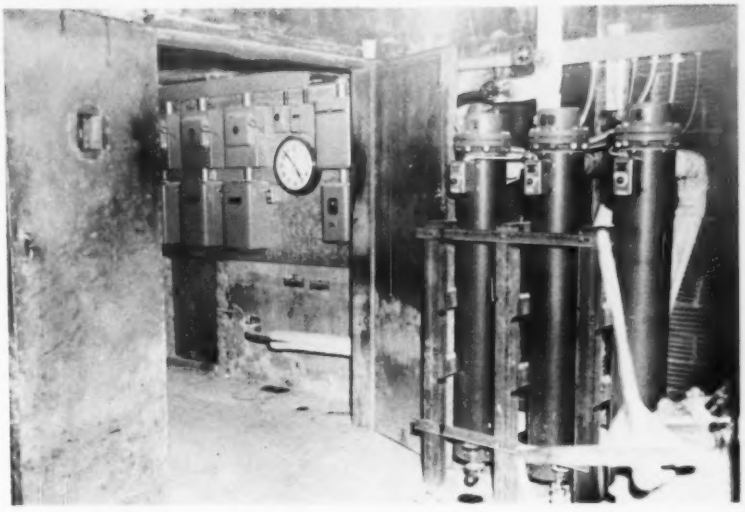
Electric Heat Takes Over As Other Fuel Fails

D. R. GUNDRY, Industrial Sales Representative, Ohio Edison Co, Elyria, Ohio

A heating installation that was dying of hardening of the arteries is back in efficient production again as a result of a switch from fuel-firing to electric heat. And the very characteristics that made the old method inefficient are helping to make the new installation effective.

The installation is a jacketed vat tank used in making synthetic rubber compounds at the Studebaker Chemical Co, Elyria, Ohio. The vat is charged with 8,000 lb of various types of latex and tar or latex and asphalt, and other ingredients. Hot oil in the jacket boils out the moisture and reduces the latex to dry solids synthetic rubber hydrocarbons, which must meet commercial and government specifications.

The outer jacket containing the oil was originally heated by direct underfired gas units. Over the years, the intense heat on the bottom of the vat carbonized the oil, providing an insulation. The process took longer and



longer to complete while the bottom of the tank grew cherry red. By contrast, the layer of carbonized insulation was an advantage for electric heat.

Three 20-kw electric oil circulation heaters were positioned in series beside the vat. The side walls of the tank were insulated with three inches of insulating block. No additional insulation was needed for the bottom.

Company officers are completely satisfied with the new operation and the operating costs. And a new vat, to be added in the future, will be heated electrically from the start.

After Hours Water Heater Saves $4,000/Yr.

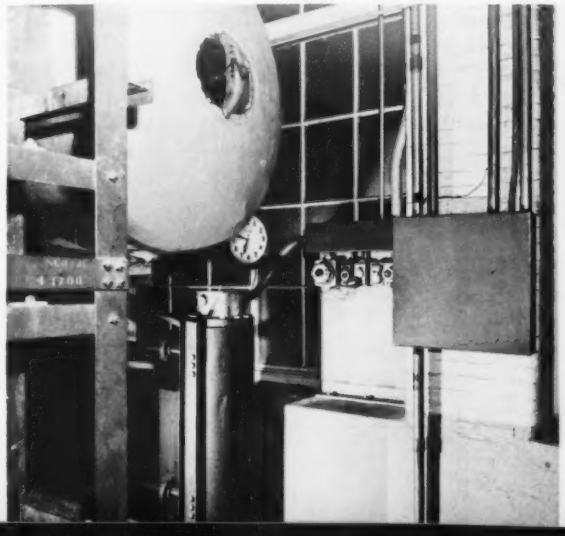
G. C. JAMISON, Industrial Consultant, Western Massachusetts Electric Co, Springfield, Mass.

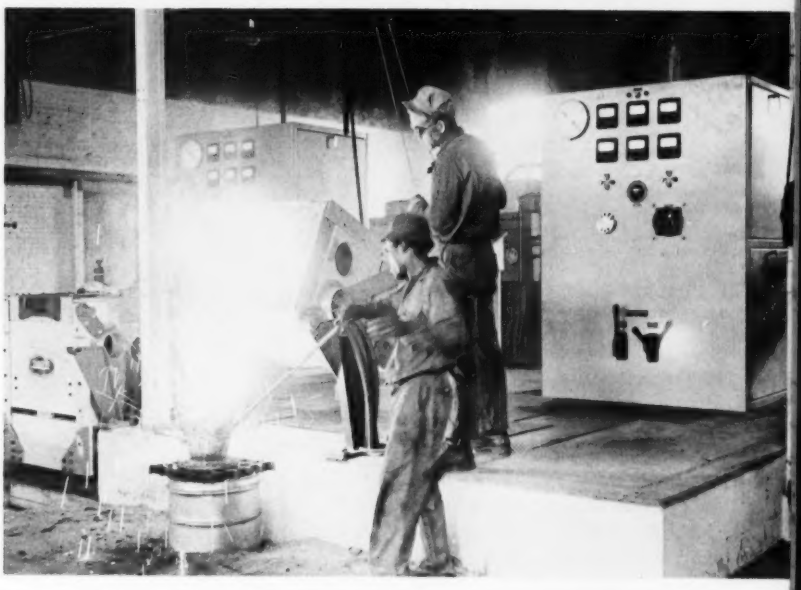
A 75-kw water circulation heater that has taken over the job of supplying sanitary and domestic hot water on summer week-ends and evenings has proven to be a big money-saver for the Stanley Home Products, Inc, in Easthampton, Mass. In the three years since it has been in use the $2,000 electric heater installation has needed no service or maintenance. And according to the owners, it has saved the company approximately $4,000 every summer.

The heater is designed to take over automatically when the regular source of steam, a 1,000-hp boiler, is not needed for building heating or process steam. Now it is no longer necessary to operate the boiler at light loads and poor efficiency. And a licensed attendant is not needed after regular working hours.

A 1,000-gal water storage tank is normally heated to 160 F by 125-psi steam from the boiler. When the need for process and space heating steam ceases, the boiler is shut down. When steam pressure falls to 25 psi, a switch in the line to the storage tank closes a 200-amp contactor supplying 440-v power to the heater. A clock registers the operating hours for cost evaluation.

The result is an ample, continuous and economical supply of hot water for the office and sales staff after the rest of the plant is shut down.





Specialty steel maker finds high frequency melting . . .

Improves Alloy Control, Increases Versatility

LAWRENCE M. DURYEE, Division Sales Engineer, Connecticut Light & Power Co, Waterbury, Conn.

High frequency induction melting is proving to be the answer to close control of composition and pouring temperature in the production of heat resistant, non-corrosive stainless steels at the Eastern Malleable Iron Co, Nauguatuck, Conn. Installation of three 960-cycle furnaces, energized by two vertical motor-generator sets, was made after a lengthy study of different heating frequencies.

The investigation showed that the lower frequencies caused excessive turbulence, making metallurgical control of alloys more difficult. By contrast, there was very little turbulence at 960-cycles. Moreover, at this frequency, transfer of energy from the water-cooled coils imbedded in the ceramic pot lining to the metal is excellent. Although losses were lower at 180 cycles per second, using the open corner of a 3-phase delta-connected transformer, the saving was meaningless, since the close control required for these specialty steels could be achieved far better at the higher frequency finally selected.

Only a small billet is needed to start the charge. Even this 200-lb "starter" is not essential, although speed of melting is definitely increased by using a billet. Flexibility is another feature of the installation. Changes from one alloy to another can be made quickly and easily, a must in this type of operation.

In addition, the installation is compact, using a relatively small area of the shop. Two of the furnaces have 500-lb capacities; the third, a 1,000-lb capacity. Metal is melted in the furnace pots at a rate of 1,000-lb per hr and poured at a spout temperature of 3,000 F under excellent control. An additional 75-kw furnace, operated at the same frequency, is used to develop laboratory control of the melting processes.

The 460-v motors are fed from a dry type 750-kva load-center substation located adjacent to the furnaces and motor-generator sets. The substation is supplied with 14-kv primary power.

Electric heating is not new to Eastern Malleable Iron. Eight years ago the company installed 1,000-kw of car bottom electric annealing furnaces for continuous production of malleable and pearlitic malleable castings. These can produce as much as eight tons of castings at each heat, with excellent control and a low net cost per ton.

What's Your Production Problem?

If you have problems in lighting, drying, casting, forging, painting, or materials handling, consult your local power company. Let their experienced specialists show you how to cut costs with electric power.

WITH NEW GENERAL ELECTRIC **SOLID-STATE** EQUIPMENT . . .

You Achieve Greater Supervisory System Reliability

No moving parts, no adjustments to make—that's why you receive greater system reliability from General Electric solid-state supervisory equipment with transistorized logic elements. With these rugged new elements, which are computer-designed and factory pretested to eliminate any chance of human error, you are assured of virtually fool-proof operation.

The new solid-state plug-in logic elements eliminate malfunctions due to contact failure because there are no moving contacts. Switching and coding functions are accomplished by transistors and diodes.

For added dependability the solid-state unit uses a self-contained 12-volt power supply and regulator. Shock hazard in the solid-state unit is virtually eliminated, and you need no external battery supply. Transistorized elements are protected from accidental overvoltage, too.

All external connections to the unit are isolated electrically so that overvoltage trips out the external circuit before the transistors are affected. Protective isolation is one more feature that assures you of system reliability.

New General Electric solid-state supervisory equipment retains the proven space-code-selector type of operation. This space-code system, developed by General Electric, has demonstrated its superiority in over 16 years of successful operation.

Get all the facts. Contact your nearest G-E Apparatus Sales Office, or write for bulletin GEA-7043, General Electric Co., Schenectady 5, N. Y.

513-10

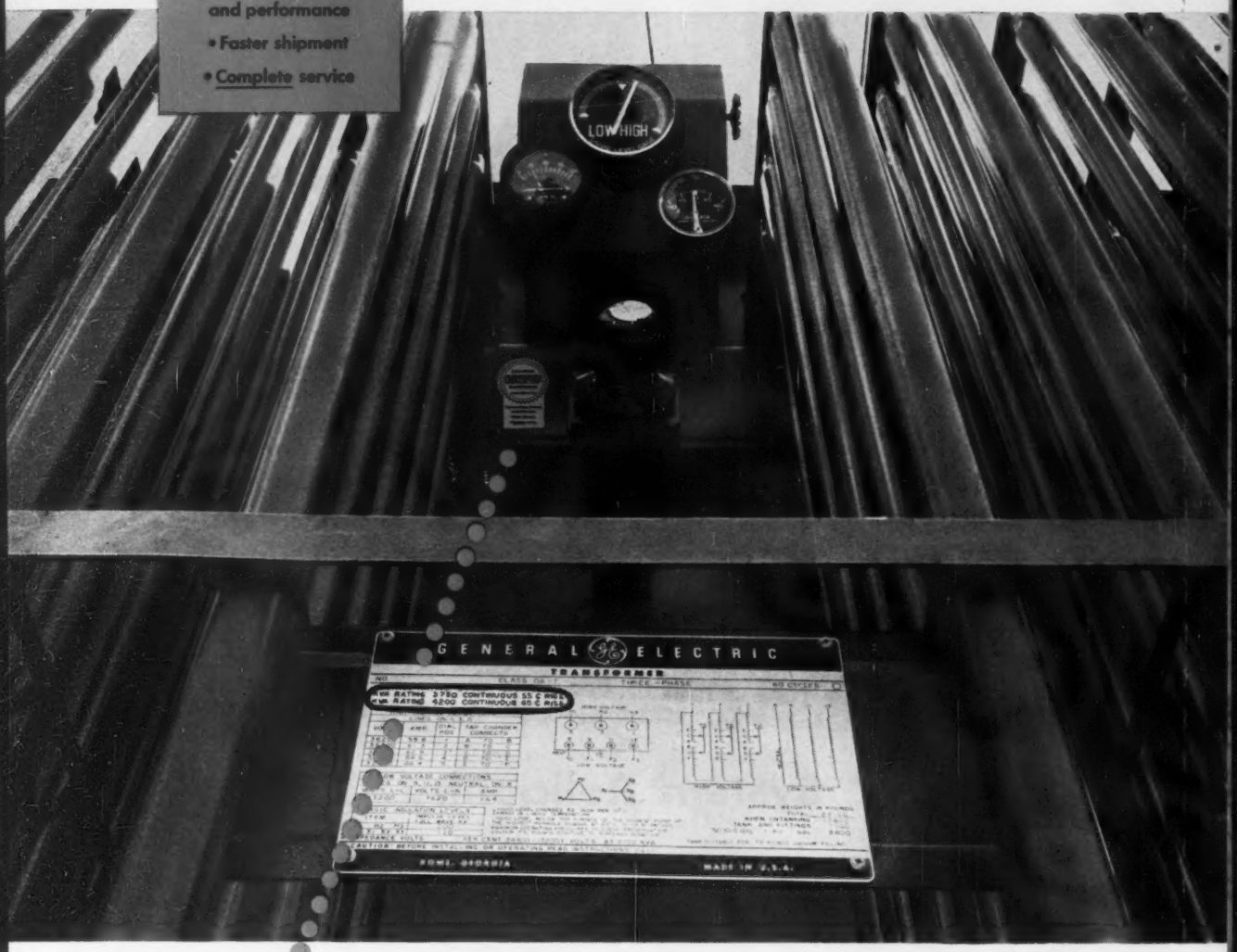
Progress Is Our Most Important Product

GENERAL ELECTRIC

FULL-VALUE
CERTIFIED
TRANSFORMER
GENERAL ELECTRIC

- Superior design, features, and performance
- Faster shipment
- Complete service

NOW 12% higher



SYMBOL OF FULL VALUE

With this seal, General Electric certifies full value for your transformer dollar; full value in terms of superior basic design, features, and performance . . . plus faster order handling and shipment . . . plus complete service before, during, and after installation. No other transformer manufacturer can match this complete General Electric package.

continuous loadability

General Electric's new Permalex* insulation system increases medium transformer continuous kva capability, or gives five times longer transformer life

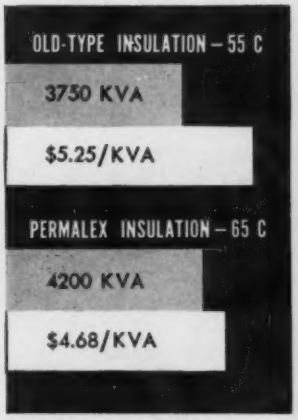
Now, as standard on all medium transformers**, and at *no extra price*, General Electric uses Permalex insulation . . . a system permitting transformers designed for 55 C rise to operate at 65 C rise with 12% more continuous capacity!

For example, a 3750-kva, 55 C transformer with Permalex will operate at **4200 kva**, 65 C rise with normal life expectancy. Or, if you prefer to operate the unit at 55 C, you can expect five times the life of present insulating systems! Fan-cooled rating increments remain the same and can be applied at the 65 C operating condition. Also, Permalex is *completely compatible* with everything in the transformer.

The Permalex system used in General Electric medium transformers features Formex† wire and cyanoethylated paper insulation. Formex insulated wire offers exceptional dielectric strength, outstanding thermal stability and high resistance to moisture effects. Cyanoethylation, which replaces many moisture producing molecules with non-moisture producing molecules, raises the thermal endurance of paper and retards the formation of water.

Ask your G-E Apparatus Sales Engineer to point out the many ways you save with Permalex insulated transformers . . . another result of General Electric's *continuing* Certified Full-value Transformer Program. General Electric Company, Schenectady 5, New York. 416-29

* Trade-mark of General Electric Company.
** 501 to 7500 kva, 69 kv and below.
† Reg. Trade-mark of General Electric Company.



PERMALEX INSULATION gives you extra kva at no additional transformer cost. The result is more economically uprated substations because of the lower cost per kva with no increase in transformer size.

55 C Self-Cooled	65 C Self-Cooled	65 C Fan-Cooled
750 kva	840 kva	966 kva
1000	1120	1288
1500	1680	1932
2000	2240	2576
2500	2800	3500
3750	4200	5250
5000	5600	7000
7500	8400	10500

DEFERRED CHANGEOUT of added kva gives more years of operation without extra investment. Real evaluation of Permalex is measured by present worth of capitalized value of deferred investment.

FORMEX TURN INSULATION with cyanoethylated paper insulation provides high dielectric strength, outstanding resistance to moisture and much longer life for medium transformers.

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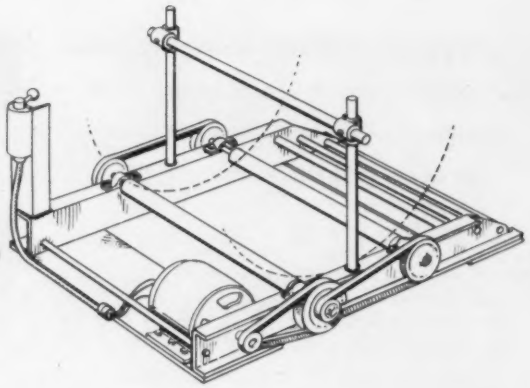
Stationary Reeler Speeds Handling of Wire

CLAUDE A. BELSHE, Supt. of Utilities, Colby Municipal Utilities, Colby, Kansas

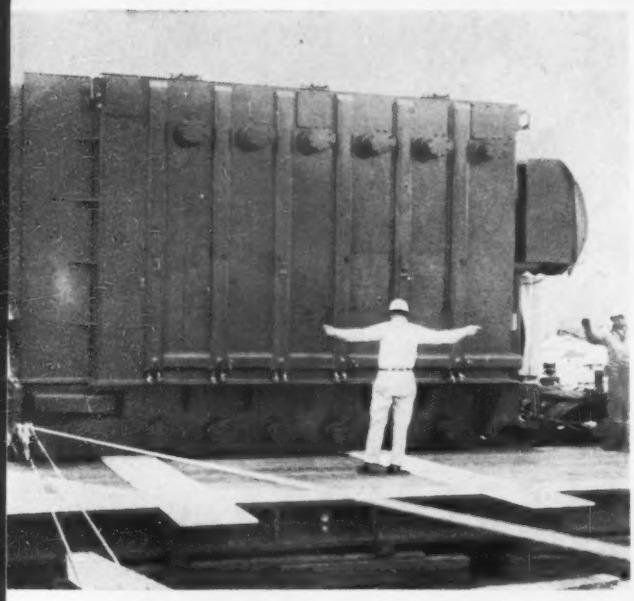
A stationary power reeler has considerably reduced the time and labor of loading or unloading wire reels in the wire storage yard of Colby Municipal Utilities. The reeler will handle reels up to 72 in. in dia and up to 2000 lb fully loaded. The reeler consists of two 4-in. pipe rollers, a 3-phase, 3-hp motor to drive the rollers, a drum reversing switch, and a reel pipe, all of which are mounted on a channel-iron base.

The rollers, which turn the reel on its rims, are belt driven. The pulleys are mounted on 1¼-in. shafting centered inside the 4-in. rollers. The shafting extends about 4 in. beyond the ends of the rollers and is welded into the rollers with reducing plates on each end. Shafting rides on self-aligning ball bearings at each end of the roller. The double pulley is supported by, but not fixed to, the roller shaft.

To give stability to reels, particularly lighter reels, as they are turned, a 2-in. pipe is inserted in a reel and then keyed into place on two vertical pipes on the reeler. Braces on the reel base form an incline to make it easier to move reels on and off the reeler.



Soaped-Plywood Aids Transformer Move



The "soaper" method, which uses the lubricating qualities of soap on a smooth surface, recently enabled Long Island Lighting Co to reduce the labor and time normally required to move two 127-ton transformers from railroad car to substation site.

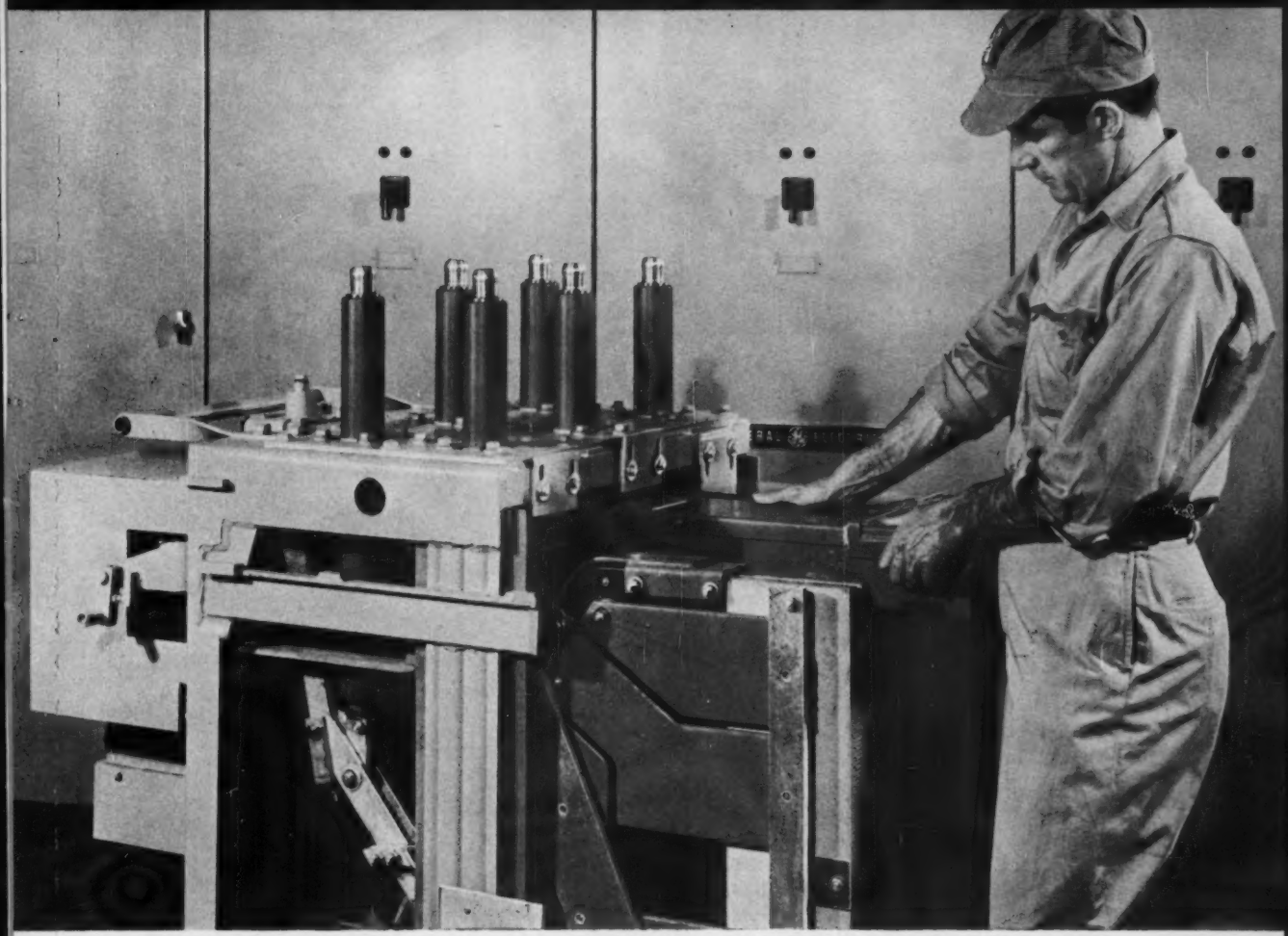
This method involves the use of two sheets of plywood, one above the other, with their facing surfaces well lubricated with laundry soap. Soaped plywood sheets are then placed beneath as well as ahead of the heavy objects to be moved. The inherent friction between the unlubricated surfaces of the plywood and metal or other material prevents the lower sheet from moving, while allowing the upper sheet to slide smoothly with the equipment.

LILCo controlled the movement of the transformers from the railroad car to the trailer, and from the trailer to the substation site, with a winch line at each corner of the transformer.

The combination of excellent rigging techniques and modern heavy hauling equipment made it possible to unload both transformers from railroad cars, transport them to the jobsites and place them on their foundations, for a total cost of only $5,825.

Change hats with your maintenance man, he will demonstrate . . .

FAST MAINTENANCE



General Electric's exclusive *Vertical Lift* Metal-clad Switchgear gives you 20 minute routine maintenance

Reduce your switchgear operating expense with the fast, efficient maintenance made possible through General Electric's Vertical Lift design.

Your maintenance man can expose the contacts of General Electric Metal-clad switchgear in just one minute—for cleaning, inspection and adjustment—by removing only the box barriers. Arc chutes can be left in position.

And under normal conditions, G-E Magne-blast breakers can be removed from their housing, given routine maintenance, and returned to service in just 20 minutes.

This fast routine maintenance saves you costly maintenance time—another reason why General Electric manufactures Vertical Lift Metal-clad switchgear.

Contact your General Electric switchgear representative for more information, or write for Metal-clad bulletin, GEA-5664, to Section 511-38, General Electric Company, Schenectady 5, New York.

VERTICAL LIFT'S 3 STEPS TO SWITCHGEAR SUPERIORITY:

STEP 1: Disconnect breakers automatically—only Vertical Lift design permits operator to actually see when disconnects are parted.

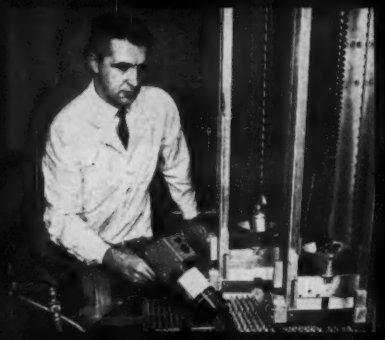
STEP 2: (Illustrated) Remove breaker, slide out box barrier—Vertical Lift design allows operator to inspect contacts without moving arc chutes.

STEP 3: Remove protective cover—only Vertical Lift Metal-clad has the breaker operating mechanism up front for easy access.

Progress Is Our Most Important Product

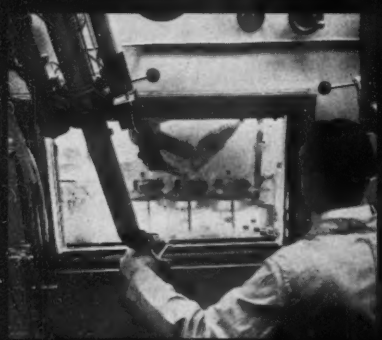
GENERAL ELECTRIC

1. Plant construction begins with sphere excavation



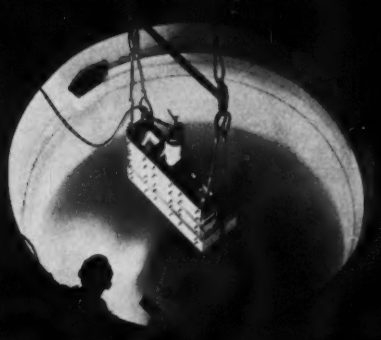
2. Core computations checked in critical assembly

3. Vallecitos BWR furnishes vital operating data



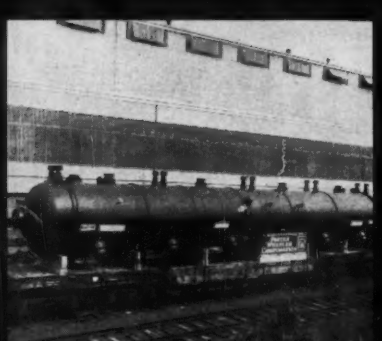
4. Reactor materials and fuel are evaluated

5. 190-ft diameter containment sphere takes shape

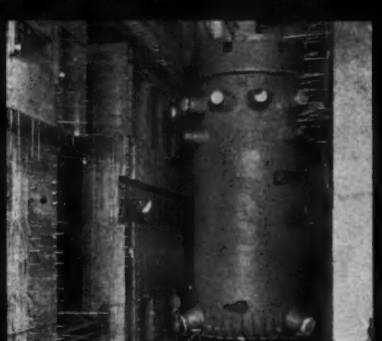


6. Refueling methods are studied by G-E engineers

7. 300-ton reactor pressure vessel arrives at site



8. Primary steam drum is readied for shipment



9. Reactor pressure vessel is placed in position

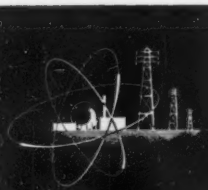
Dresden at full power

World's largest nuclear power reactor is providing first BWR plant operating data

On June 29, the Dresden Nuclear Power Station produced rated electrical output of 180,000 kilowatts net—three times the power produced by the next largest operating nuclear plant in the United States. The practical operability of large boiling water reactors has now been demonstrated, and the first actual operating data from a large-scale commercial nuclear plant is available to the designers of tomorrow's reactors.

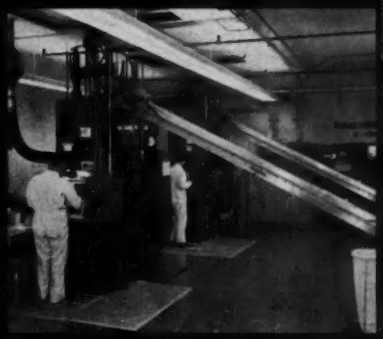
Following a brief demonstration run at full power, the plant is undergoing a series of tests at various power levels. Operating results so far have confirmed General Electric's belief that large boiling water reactors are the most promising type to supply early economical power.

The pioneering Dresden station was designed and built by General Electric for the Commonwealth Edison Company and the Nuclear Power Group, Inc.*—with



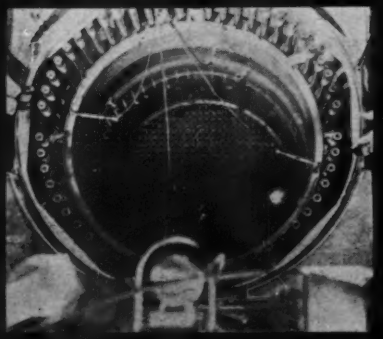
General Electric
Boiling Water Reactor Technology
Helps Lower Nuclear Power Costs

VALLECITOS
BOILING WATER
REACTOR



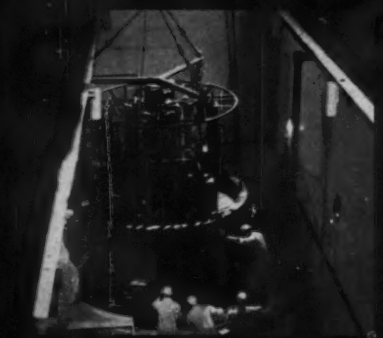
10. Oxide fuel is manufactured by G.E. in San Jose

11. Rod-type fuel elements are assembled

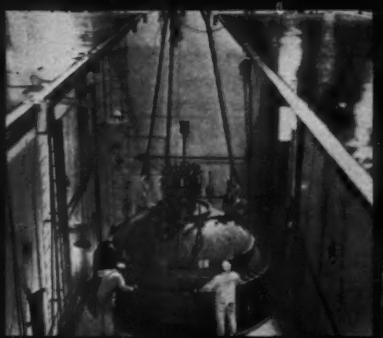


12. Core contains over 60 tons of uranium fuel

13. Modern instrumentation system is tested at site

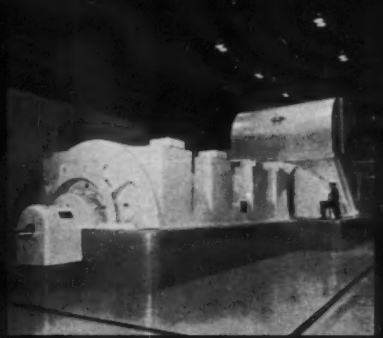


14. Huge turning vane is installed in reactor



15. 56 bolts hold the pressure vessel head in place

16. Plant is operated from the main control room



17. Turbine-generator produces at 192,000-kw rate

18. Dresden — largest operating nuclear power plant

Bechtel Corporation as engineer-constructor. The plant is scheduled to be turned over to Commonwealth Edison Company this fall as a dependable power-producer on the Commonwealth Edison system.

For more information on General Electric's commercial nuclear activities, call your G-E Apparatus Sales Office, or write General Electric Company, Schenectady, New York. Outside the U.S. and Canada, write to International General Electric Company, 150 East 42nd Street, New York 17, N. Y. 132-06

* American Electric Power Service Corp.; Bechtel Corp.; Central Illinois Light Co.; Commonwealth Edison Co.; Illinois Power Co.; Kansas City Power & Light Co.; Pacific Gas & Electric Co.; Union Electric Co.

DRESDEN OPERATING RESULTS SO FAR

1. Core stability extremely high
2. Automatic load-following exceptionally good
3. Flat flux pattern throughout core as predicted.
4. Off-gas release negligible
5. Radiation levels in turbine area within permissible limits
6. Instrumentation remarkably trouble-free

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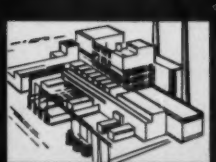
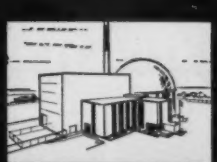
DRESDEN NUCLEAR POWER STATION



HUMBOLDT BAY NUCLEAR POWER STATION



BIG ROCK POINT POWER PLANT

Test Heat Pump Compressor Capacity

E. E. UMLANG, Supervisor, Test and Statistical Div, Texas Power & Light Co, Dallas, Tex.

The following is a relatively accurate method of quickly determining how much heat the compressor unit of a heat pump is producing. It requires two identical thermometers (5½-in. glass), a watch, a flashlight, and preferably two persons. The procedure applies to a standard residential installation or to a small commercial installation having a self-contained kilowatt-hour meter.

Procedure:

1. Select a time when (a) the miscellaneous electrical load in the house can remain constant and (b) when the outside temperature is less than 40F and preferably near or below freezing.

2. Insert thermometers through test holes in duct on the suction side of the air handling unit and on the discharge side beyond the auxiliary strip heaters. (Sometimes this can be done through canvas connections between the ducts and the unit or through holes made in the ducts by the installer —or if a return and/or supply grille are very near the unit, the temperature at those points may be used without too much error.)

3. With the compressor operating but with no strip heaters, record the following:

a. Temperature leaving unit _____ F

b. Temperature entering unit _____ F
Temperature difference _____ F **(A)**

c. Revolutions per min by kwhr meter disc _____ **(B)**

4. Raise thermostat setting so that auxiliary heater starts operating, and after waiting a few minutes to allow the discharge temperature to become stable, record again:

a. Temperature leaving unit _____ F

b. Temperature entering unit _____ F

c. Temperature difference _____ F **(C)**

d. Revolutions per min by kwhr meter disc _____ **(D)**

5. From nameplate of kwhr meter, determine the disc constant K_s = _____ (this is usually shown as K_s and will normally be a value such as 3.6, 4.0, 7.2, etc.)

6. Use the following formula to determine the Kw input to the auxiliary heaters:

$$\frac{(D - B) \times 60 \times K_s}{1{,}000} = \text{kw input to heaters.}$$

$$\frac{\quad \times 60 \times}{1{,}000} = \_\_\_\_ \text{ kw (this should}$$

be reasonably near the rating of the heaters.)

7. Btu supplied by heaters = 3,413 x kw = _____ Btu **(E)**

8. Determine Btu supplied by compressor unit as follows:

$$\text{Btu} = \frac{A \times E}{C - A} = \_\_\_\_$$

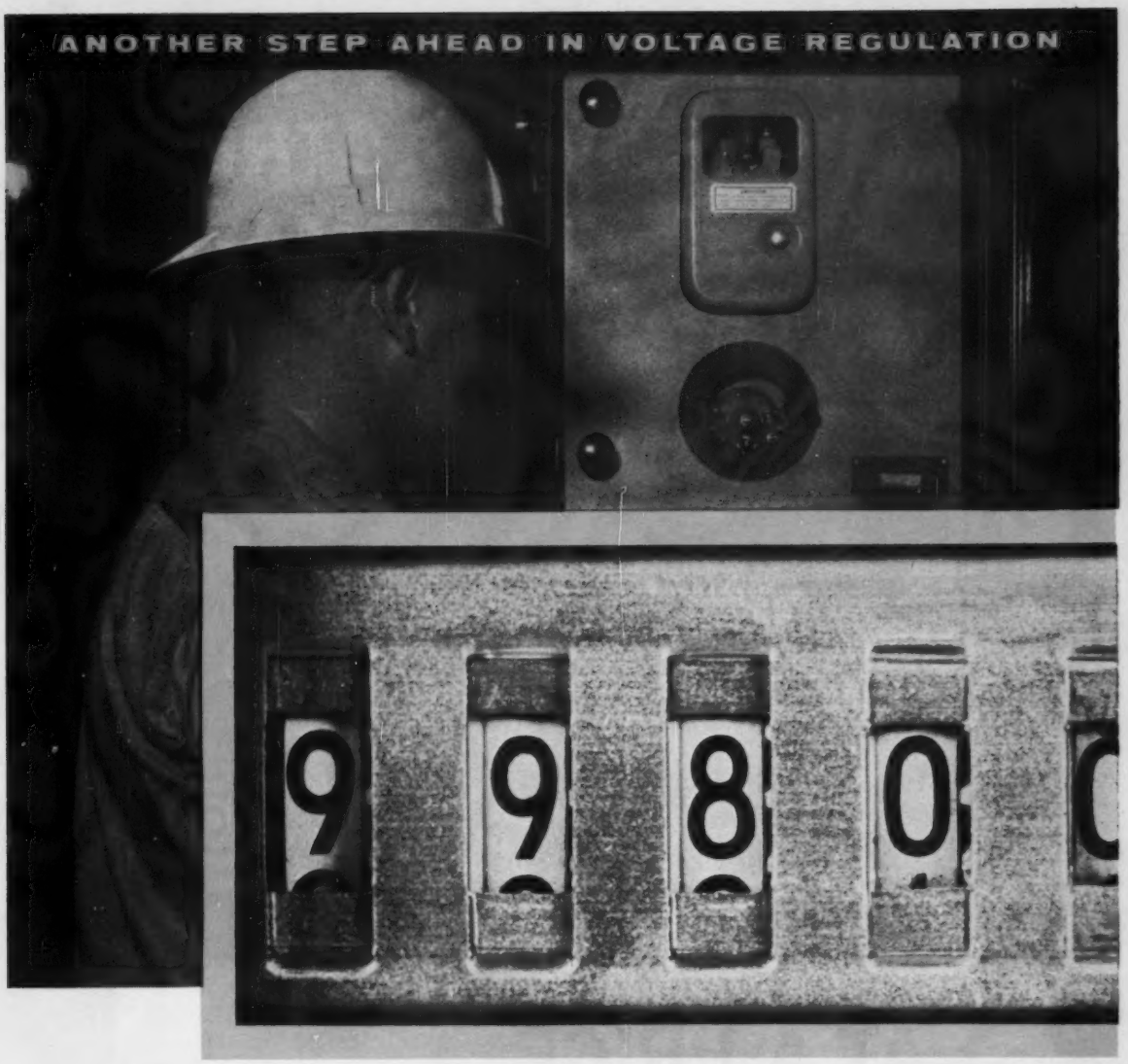
9. Unit make and model _____ Outside temperature _____ F Return air temperature _____ F Rating of compressor unit at above temperatures _____ Btu

Notes.

1. If the calculated value of heating Btu is not relatively close to the unit rating, there is probably trouble with the unit.

2. Letters **(A)**, **(B)**, **(C)**, **(D)** and **(E)** used in Steps 3, 4 and 7 serve to identify values used in the formulas in Steps 6 and 8.

3. CAUTION—it is possible that unusual conditions in the system could produce inconsistent results in which case more elaborate tests would be necessary.



The facts behind the counter

To help you prove that G-E regulators cost less on the line

The operations counter on a General Electric step voltage regulator tells three vital facts-at-a-glance to the man who has to know—whether he be maintenance man, substation operator, or systems engineer.

FIRST—*If full advantage is being taken of the reduced bandwidths inherent in 32-step regulation—how much have regulator operations increased due to bandwidth reduction?* To provide *you* with an immediate answer for *your* system, *every* General Electric step voltage regulator is equipped with an operations counter. Through analysis of actual data, General Electric computer studies indicate that bandwidths as small as $\pm 3/4$ volts are desirable and feasible from *any* standpoint, including that of equipment life.

SECOND—*Is the regulator due for contact inspection?* General Electric voltage regulator design permits precise coordination of maintenance inspection with a definite number of tap-changer operations. The operations counter, therefore, eliminates any guesswork from the timing of major internal inspections. (You may find that G-E regulators on your system can be allowed to operate up to 25 years without switch-contact maintenance.)

THIRD—*How many regulator operations have occurred since the last inspection?* Any malfunction of the regulator controls, or system changes, will be reflected on the counter. This reliable "barometer" of regulator or system ills is another important reason why G-E regulators cost less on the line.

For more information on "the facts behind the counter," see your G-E apparatus salesman. Or, write General Electric Company, Section 456-04, Schenectady 5, N. Y. *Voltage Regulator Product Section, General Electric Co.*

Progress Is Our Most Important Product

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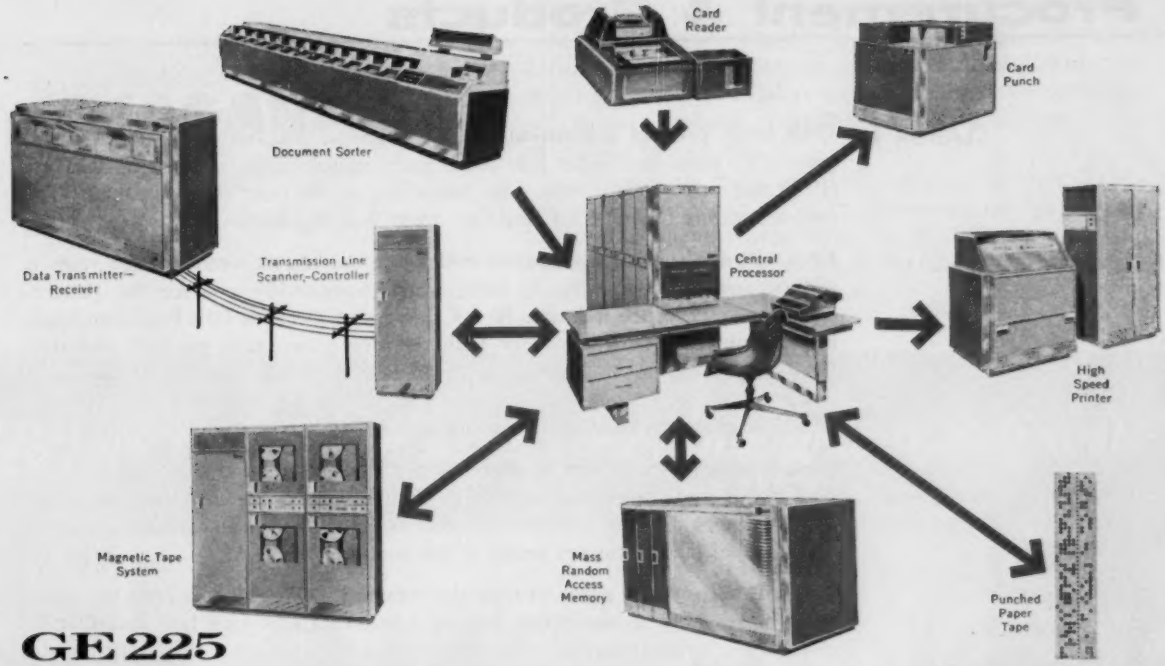
NEW GENERAL ELECTRIC GE 225 INFORMATION PROCESSING SYSTEM...

SMALL OR LARGE COMPUTER FUNCTIONS

DATA PROCESSING
AUTOMATED BY GENERAL ELECTRIC



GE 225

FLEXIBILITY

provides these benefits for business, industrial, scientific, military and engineering applications:

• Data mating function enables GE 225 to be teamed with every major peripheral device—new MICR* documents, punched cards, punched paper tape, magnetic tape, mass random access memory, drum memories, high speed printer, typewriter, high speed transmission lines. The new GE 225:

performs a multitude of jobs at much lower cost.

provides greatest efficiency—maximum utilization of machine time.

allows low cost input-output additions and substitutions.

permits many varying and money-saving applications within one organization—including minimum cost conversion.

• High speed operation—25,000 five-digit additions per second.

• Compactness and low power requirements reduce cost of installation, site, air-conditioning, operation and maintenance.

• Practical for use in smaller firms where computer operation has heretofore been unfeasible.

• Full range of services available—programming aids package, training and consultation, back-up computer centers, and maintenance program.

For more detailed information, write today for brochure CPB-101 on the new GE 225 Information Processing System. Also available: brochure CPB-81 on the GE 210 Data Processing System.

Write to: General Electric Company • Computer Department • 13436 No. Black Canyon Highway • Phoenix, Arizona.

*Magnetic Ink Character Recognition

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GENERAL ELECTRIC

CPA-30 (7-60)

General Electric—A pioneer in computer systems for all phases of business, industrial, scientific, engineering, and financial endeavor.

Procurement & Products

LABOR ▸ **1960 labor contract negotiations** at Westinghouse Electric Corp and General Electric Co move into higher gear as the International Union of Electrical Workers (IUE) and other unions meet with bargaining teams from the companies. The contracts expire Oct. 1 at GE and Oct. 15 at Westinghouse.

Even with the start of negotiations with other unions, the center of the stage is still occupied by the IUE-GE talks, which traditionally produce the pattern-setting contract for the industry. So far, the sessions between IUE President James B. Carey and GE's chief negotiator, Philip D. Moore, have been generally amicable. But GE has yet to put the details of its offer on the table in answer to the union demands for a 3½% wage increase, supplementary unemployment benefits, greater employment security, and a host of other items.

The company says only that its offer will be "less substantial than in recent years." And in GE management memoranda on the 1960 talks, the ever-recurring theme is that "1960's different problems of domestic and foreign competition" require a "reversal" of the inflationary trends of the post-war years.

It is still too early to guess whether the company's offer will preclude the possibility of reaching an agreement without a strike. Carey said last year that he owed GE a strike, referring, of course, to the fact that only Westinghouse was struck in 1955 when the present five-year contracts were negotiated. But so far this year, Carey has been quite soft in his approach to the bargaining table and has not vigorously wielded the "strike club."

PRICES ▸ **More companies announce 5% price increase on insulators,** following Ohio Brass Co's announcement three weeks ago. I-T-E Circuit Breaker Co's Victor insulators division has made the change, effective Aug. 15, on low-voltage pin-type, guy strain, and suspension insulators less than 10-in. in diameter. But Victor says it is not increasing the price of spool insulators "at this time," pending completion of a cost study. And Lapp Insulator Co says it, too, is announcing a 5% increase on low-voltage pin-type, distribution post, guy strain, and suspension dead-end insulators of less than 10-in. in diameter.

The manufacturers believe the rest of the industry will go along with the increases, but say it will take some weeks before they know whether the new prices will hold. They find utility reaction "reasonably favorable." "At least the utilities aren't screaming bloody murder," one adds.

MARKETING ▸ **Move toward greater customer orientation in its marketing approach** is in its final phases at GE. Last year GE began the shift away from product-orientation in its sales efforts by setting up two units in the field, one for generation, transmission, and auxiliaries equipment sales, the other for distribution equipment sales. Then early this year, the company split its apparatus and industrial group into an electric utility group and an industrial group.

Now GE is in the process of filling in the gaps. Last week, it reassigned the apparatus sales division into three new operations, electric utility sales, electric utility engineering, and industrial sales. The final phase, which is now in progress, is to create two district sales managers for each district, one for industrial products, the other for electric utility products. M. F. Kent, manager of the electric utility sales operation, says relations between utility purchasing agents and company sales representatives won't be affected in any way by these latest moves.

PRODUCTS ▸ **Electro-Motive division of General Motors Corp introduces 10,000-kw diesel** peaking and reserve power plant carrying a price tag of $82/kw at the factory... General Electric extends 55/65C dual rating to large power transformers.

NIAGARA

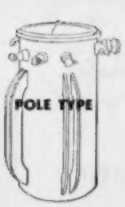
TRANSFORMERS

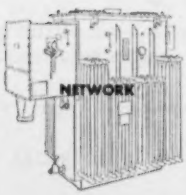
"No exceptions. Not a single Niagara Transformer reaches the shipping platform without being thoroughly tested."

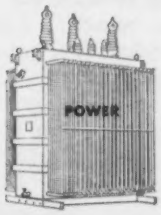
At Niagara, product quality is watched all along the line... starting with raw materials. To win an "ok" for shipment, completed transformers must pass rigid performance tests. Not only do they conform to NEMA and ASA standards, but in many ways exceed them.

Designed with liberal overload capacity, Niagara Transformers are produced for practically every service through 10,000 kva, 69,000 volts. Write for Bulletin 139. Niagara Transformer Corp., P.O. Box 23, Buffalo 25, N. Y. Representatives in principal cities.

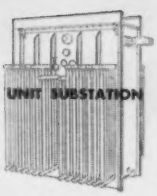
"Before they leave here, every one gets a stiff test."

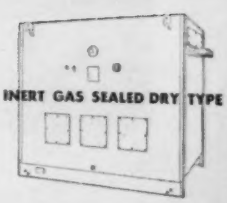

POLE TYPE


NETWORK


POWER

VENTILATED DRY TYPE


UNIT SUBSTATION


INERT GAS SEALED DRY TYPE

Indicators Measure Value of Line Shielding

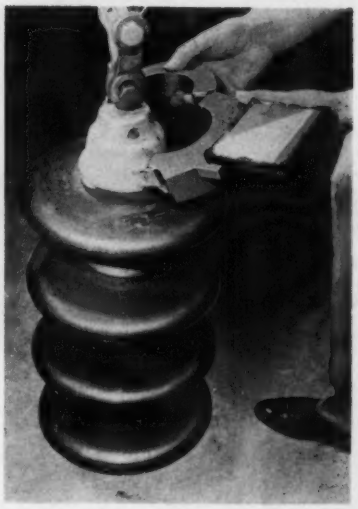
Five hundred shielding failure indicators like this (being snapped on insulator in photo, right) were delivered recently by General Electric Co for installation on insulators of 345-kv transmission towers of Ohio Power Co of American Electric Power System. They will be used in lightning flashover studies being conducted by AEP at Lima, Ohio, to measure the effectiveness of transmission line shielding. The indicators were especially designed by GE as part of its cooperation with AEP to determine the exact mechanism of lightning flashover.

Indicators will provide comparison of the number of flashovers caused by lightning striking the phase conductor to the number of flashovers caused by it striking the shielding—the tower or its ground wire. By studying resulting data, utility engineers will be able to determine the optimum shielding angle for the existing ground wire; whether an additional wire might be required; or if additional insulators will be the most feasible solution to flashover problems.

The design is essentially a copper winding on a toroidal iron core, completely encapsulated in epoxy resin. Core is split to provide easy snap-on insulation on the insulator. Winding is loaded with encapsulated resistance, terminals of which are connected to two electrodes of a Lichtenberg figure recorder. According to GE engineers, the resistance is needed in the circuit because the waveshape of the output voltage must be the same as the waveshape of the input current.

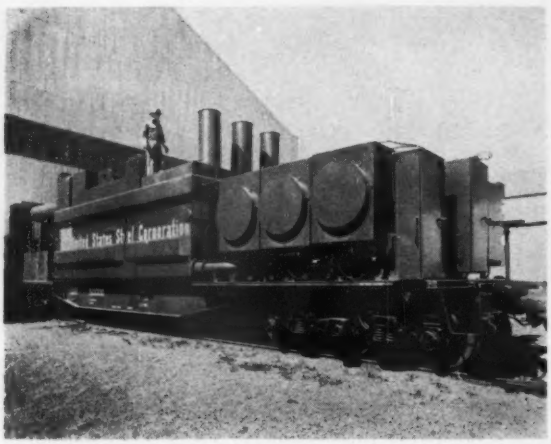
This type of recorder is designed for "one-shot" operation; film must be replaced after each exposure. Linemen determine whether lightning has struck at a given installation by checking insulators for signs of lightning damage.

The indicator actually records whether lightning travels from the crossarm of the transmission tower to the conductor, or vice-versa. By making an assumption which is about 90% accurate, i.e., that lightning is of negative polarity, the device makes it possible to determine the cause of flashover by registering the direction of the lightning current on the Lichtenberg figure recorder. (A flashover caused by a lightning bolt to the tower or ground wire causes current to flow from the conductor to the crossarm. Flashover caused by a lightning stroke directly to the conductor has reverse polarity, i.e., from the crossarm to the conductor.)



Record of the lightning current is permitted to remain intact because the core of the device is saturated by the 60-cycle current which follows the lightning flashover. Shape of the Lichtenberg figure provides a way of positively identifying the polarity of the current flow, inasmuch as positive and negative figures have different characteristics.

Mobile Transformer Serves United States Steel Plants



Westinghouse Electric Corp has furnished United States Steel Corp with this mobile 60-Mw power transformer to permit the company to operate at or near full capacity should power systems of various plants become inoperative. The unit is installed on a specially constructed, 55-ft railroad flat car stationed at the Irvin Works of USS, ready to be transported to different company operations.

First of its type built by the manufacturer, the unit has a wide range of primary and secondary voltages on both 25 and 60 cycles. It can serve all primary voltages between 6.6 and 132 kv and all secondary voltages between 2.2 and 69 kv.

Provisions have been made for spare circuit breakers, protective control devices and similar equipment.

(*More News of Manufacturers, page* 79)

Bethanized Strand protects Niagara Mohawk line

Here is part of a 47-mile transmission line near Buffalo, built recently for Niagara Mohawk Power Corporation. Because the line traverses an industrial area, Bethanized "C" coated strand was selected for overhead ground wires. The ground wire, manufactured to ASTM Specification A-363, is 7/16-in. 7-wire extra-high-strength strand.

With Bethanized strand, you can select from four coating weights to provide adequate protection against corrosion. The coating is applied by Bethlehem's special electrolytic process which makes possible a uniform, tightly bonded zinc coating that is 99.9 pct pure.

The "A" coating weight is intended for service where atmospheric conditions are good. The "B" coating contains twice, and the "C" coating three times, the weight of the "A" coating. The "D" coating, which comes in common, Siemens-Martin and high-strength grades, contains four times the weight of the "A" coating. If you would like to have full details, write to the nearest Bethlehem sales office.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

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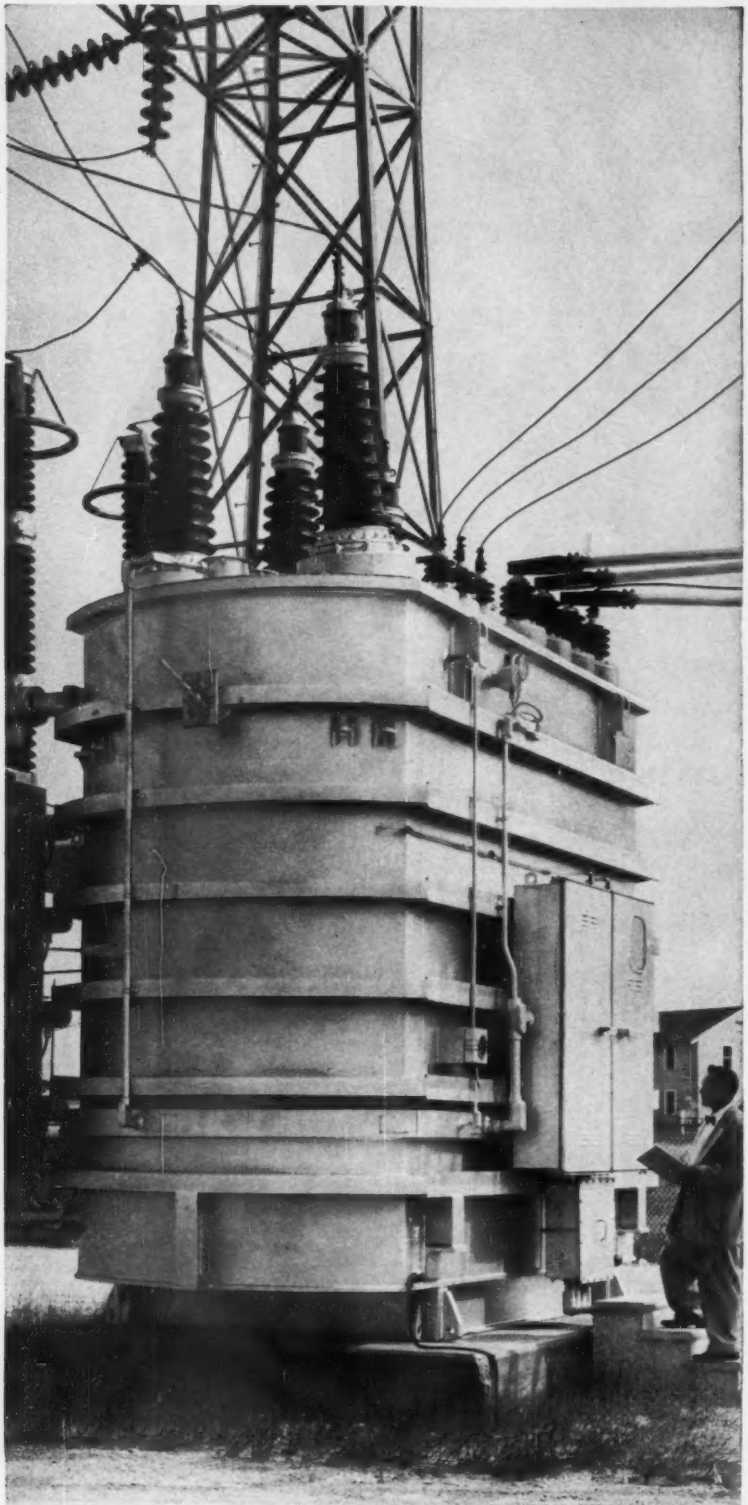

Installation view of a high efficiency 53,333 kva power transformer

UNIVOLT® 35 TRANSFORMER OIL

High Oxidation Stability... Low Power Factor

Univolt 35 is an outstanding transformer oil because of its excellent oxidation stability, low power factor and lasting insulation action. This dependable, proved-in-use product is refined from a high quality, specially selected straight mineral oil. Its highly desirable characteristics include low viscosity, freedom from acid, alkali and corrosive sulfur, and compatibility with the varnish finishes of coils.

Univolt 35 offers outstanding performance under the conditions of extreme heat produced by peak summer loads serving commercial and home air conditioning. The utmost care is taken in transporting Univolt 35: it is shipped in specially prepared and inspected tank cars which are loaded indoors.

Univolt N36 is another high quality transformer oil. Perfected by Esso Research, it possesses all the characteristics of Univolt 35 plus an effective oxidation inhibitor. For complete information write: Esso Standard, Division of Humble Oil & Refining Company, 15 West 51st Street, New York 19, New York.

Esso

In Industry after Industry..."ESSO RESEARCH works wonders with oil"

Consolidation of Kearney With Three E Announced

It was announced recently that James R. Kearney Corp, St. Louis, and the Electrical Engineers Equipment Division of Hubbard & Co, Chicago, have consolidated. This is the latest in a series of steps by Hubbard and Kearney to combine efforts in the fields of engineering, manufacturing and marketing of products for electrical transmission and distribution.

Three E, operating as a division of the Kearney Corporation occupies 75,000 sq ft of manufacturing area, situated on 17 acres. Engineering, manufacturing, sales and service personnel of Three E are being retained.

B-L-H Awarded Contract For Oak Ridge Components

Baldwin-Lima-Hamilton Corp has been awarded a $2.3-million contract to construct the pressure vessel, pressure vessel liner, and core support for the Atomic Energy Commission's experimental gas-cooled reactor at Oak Ridge, Tenn. H. K. Ferguson Co, prime contractor for the reactor, placed order with B-L-H for the work. Project will determine reliability of the gas-cooled reactor concept.

The steel pressure vessel will be 20 ft 8 in. OD, with wall thickness of 2¾ in. It will weigh 170 tons. Inside height of the cylindrical vessel with dome-shaped top and bottom heads, will be 46 ft.

The stainless steel liner, weighing 40 tons, with 1-in. wall thickness, will serve as a temperature barrier. Helium has been selected as the coolant gas because it is inert and has excellent heat-transfer properties. This coolant will flow through the reactor core and between the barrier and pressure vessel. As it is pumped through the reactor core, it will reach 1,050 F and 315 psi before being pumped to a steam generator. Heat in the helium in the steam generator will produce steam at 900F and 1,250 psi. Then the helium will be recycled to the reactor.

At the core of the reactor will be a vertical graphite cylinder built of 16-in.-sq graphite bricks in vertical column 19 ft, 4-in. high. The core support sustaining the graphite core will consist of a vertical cylindrical shaft of 1-in. wall thickness embedded at the bottom of the pressure vessel, and a series of horizontal lattice-type plates. Pellets of uranium dioxide contained in the 1,296 fuel assemblies mounted in the core will fuel the reactor.

Aluminum-Brass Tubes Welded on Condenser

The 375-Mw welded condenser which Consolidated Edison Co will install at its Astoria station, Unit No. 4, is reportedly the first such unit to use aluminum-brass condenser tubes. Half of them were

supplied by Phelps Dodge Copper Products Corp. About 49,000 tube ends were welded (above), each taking 15 to 18 sec. A special automatic Phelps Dodge welding gun was used for welding tubes to tube sheets, equipped with preset relays and timers, which control the actual weld. American Brass Co made 50% of the tubes.

Canned Motor Pumps Circulate Boiler Water

Westinghouse Electric Corp will provide four canned motor pumps for use in a controlled circulation boiler at Unit No. 8 of Waukegan Station of Commonwealth Edison Co. Each is rated 9,750 gpm and will operate at 1,800 rpm, pumping water up 665 F, at 2,400 psi.

Bechtel Corp serves as consulting engineering firm; Combustion Engineering, Inc, is building the boiler.

Canned motor pumps have these features in use on controlled circulation boilers which conventional pumps do not have; points out Westinghouse. (1) They require no external glands. (2) Valves and instrumentation for sealing conventional pumps using injection water are eliminated. (3) No seal maintenance or external bearing lubrication is needed. (4) The canned motor pump can withstand full temperature and pressure at hot stand-by conditions. (5) When the pump is in operation, no adjustments are necessary; the pump can be started and stopped at any time at full pressure and temperature.

Internal Steam Separation Developed for Reactors

Several prototype separator designs have been successfully tested, reports General Electric Co, as result of experiments conducted by its atomic power equipment department. An extensive development program was started in 1958, because the department's project engineers felt that more compact, high-capacity separators than are presently available are needed for application within reactor vessels.

Steam-water mixture produced in a forced-circulation, boiling-water reactor power plant is generally passed through mechanical separators in a pressure vessel which is outside the reactor. Elimination of the external vessel and its associated piping will result in lower plant capital costs, says GE.

Performance of experimental steam separators is now checked in a special test loop facility at Pacific Gas & Electric Co's Moss Landing power plant, near Watsonville, Calif.

The company has an air-water loop at its San Jose plant which is a model of the Moss Landing steam-water loop except for substitution of air for steam. This makes it possible to screen preliminary separator designs by viewing the separators in operation.

Use of internal steam separation equipment has been proposed for the improved-cycle, boiling-water reactor which GE will build for the Atomic Energy Commission near Los Angeles.

(*More Procurement & Products, p* 91)

THEY DO THE JOB BETTER WITH THE RIGHT WORKING GEAR

Mine Safety Appliances Company makes the "right" working gear. *Right* because it keeps crews safe. *Right* because it's comfortable to wear. *Right* because it's convenient to use. And *right* because it lasts and lasts a long, long time.

The men in the above situation are demonstrating a typical cross-section of our product line for electric utilities, from manhole to pole top. We control quality and specifications of each and every item . . . *at MSA.*

Our products protect sensitive noggins. Sniff out atmospheric hazards. Help anchor the climber's swift sure feet. They insulate his hands against the hot stuff. Keep him dry in foulest weather. Secure his waist while high above the ground. Carry things to him he can't carry with him. Warn oncoming motorists.

Some of our products only sit and wait. Products like First Aid. Resuscitation devices. Emergency rescue equipment.

We'd like you to weigh the comparative advantages of MSA's product performance. For a demonstration, technical assistance or specific product bulletins, write: Mine Safety Appliances Company, Pittsburgh 8, Pennsylvania.

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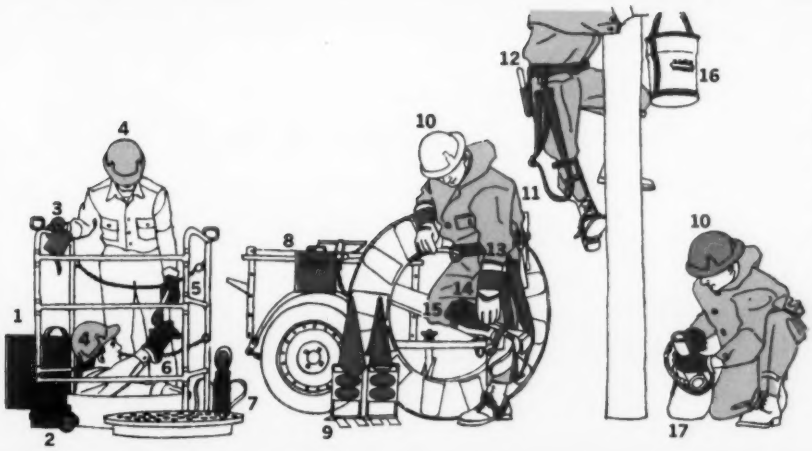


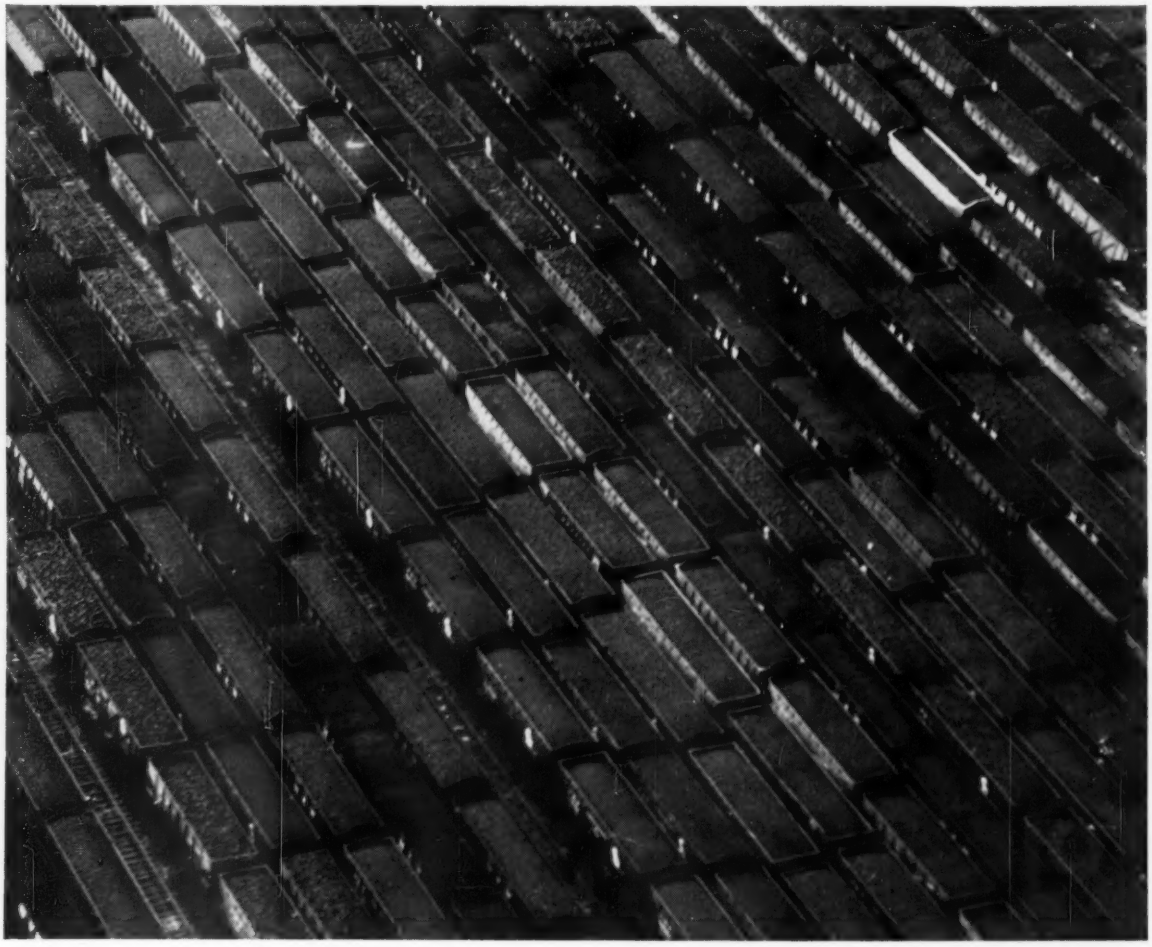
Legend for MSA Product Identification:
1. Air Line Respirator. **2.** Oxygen Indicator. **3.** Explosimeter Instrument. **4.** Shockgard Caps. **5.** CO Tester. **6.** Work Gloves. **7.** H_2S Detector. **8.** First Aid Kit. **9.** Road Markers. **10.** Shockgard Hats. **11.** Coated Rainwear. **12.** Lineman's Belt and Pole Strap. **13.** Lineman's Rubber Gloves. **14.** Leather Protector Gloves. **15.** Brooks Climbers. **16.** Tool Bucket. **17.** Line Hose Bag.

how long?...10 years?...20?...50?

(A utility needs to know!)

There has never been much room for short-term thinking in the utility business. But probably never before have utility executives and engineers been taking *the long look* in so many operating areas.

Take coal, for instance. They've been asking themselves and their coal suppliers some pointed questions: "Can we count on these suppliers to deliver the kind and quantity of coal we're going to need in the years ahead? Have they adequate reserves? Is this coal costing us over and above its invoice price in excessive coal handling, ash handling, equipment outages, freight charges on inerts? Or is it coal that eliminates these frequently overlooked incremental costs, delivers highest operating efficiency and steam at the lowest cost?" The answers you'll get to such questions from Island Creek are the kind that let you plan ahead with confidence. We at Island Creek would welcome a chance to sit down with you for a thoroughgoing discussion. Write, wire or phone.



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NELPA Study Offers . . .

Fresh Facts on Heating Load

Electric heating now looks a lot more interesting to five Northwest Electric Light & Power Association companies. And to some other utilities as well. That's because a five-company NELPA study last winter showed electric heating load factors aren't nearly as low as some critics believe. Quite the reverse—heating load factors, the study revealed, are about as good as those for non-heating loads.

The NELPA heating study, which was reported before the group's 35th annual business development conference in May, got rolling last November when the association first contacted its members. Its aim was to have companies meter electric heating demands during their winter peak. For that reason, NELPA settled on a month-long test period beginning January 5. Five utilities (Puget Sound P&L, Pacific P&L, Portland General Electric, Idaho Power, and Washington Water Power) agreed to meter at least 10 electrically heated homes, selected at random to represent a cross section of their electric heating load. Metering was to include kwhr and continuous charted demands on total as well as heating load.

Here are the findings at a glance. The data shown in the following charts refer to the "average" test home—a composite of the 50 homes tested.

Here Are Facts About The Average Test Home

The Size:

Floor area was 1,343 square feet (that's about 30′ by 45′)

The Weather:

It was cold—968 degree days during the month (below freezing much of the time)

The Connected Load:

Total connected load was 38.9 kw
(That includes everything—all appliances, lighting, heating etc.)

Of this, 14.32 kw was electric heating load

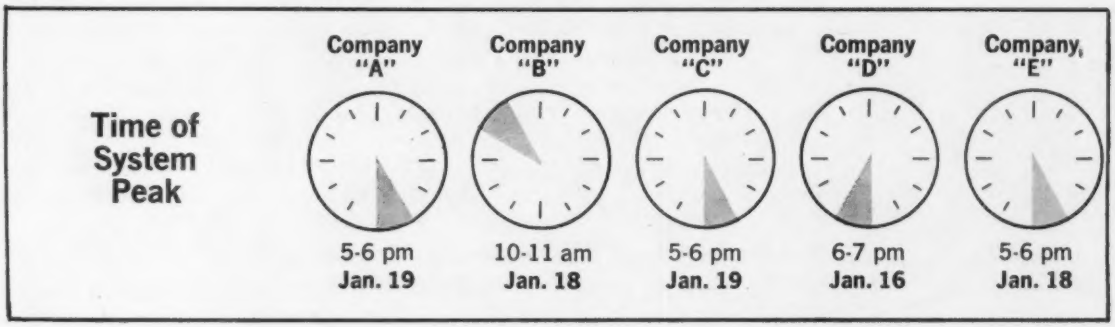
- **Altogether, the house used 3,994 kwhr during the test month**
- **And of that, a full 2,984 kwhr (or 75%) went for electric heating**
- **Which means the house used 2.50 kwhr per degree day to heat each 1,000 square feet of area**

Here Are The Major Findings of

House maximum demand	15.03 kw	Heating during house max hr load	6.73 kw
House maximum hour load	12.47 kw	Heating during system peak	5.60 kw
House load during system peak	8.56 kw	Non-heating demand during system peak	2.96 kw
Maximum heating demand	9.95 kw	Non-heating demand during max hour load	5.74 kw
Heating maximum hour load	9.07 kw		

And Here's A Breakdown

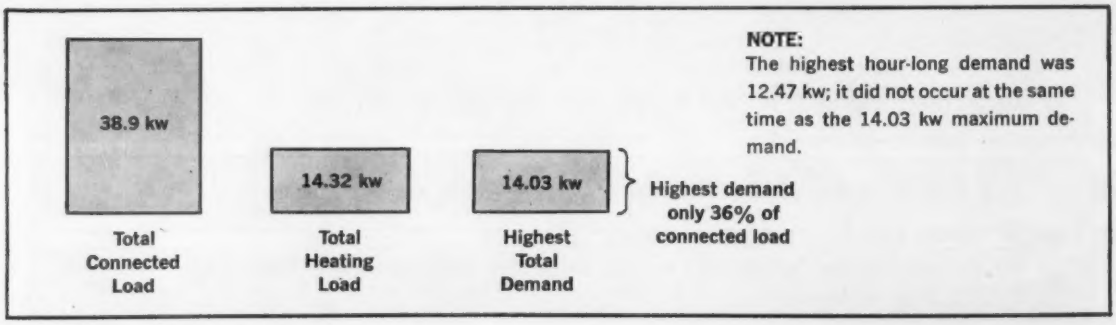
System peaks were close together, but weren't simultaneous



And system peaks generally didn't occur on the coldest day

Company	"A"	"B"	"C"	"D"	"E"
Min. Temp. on Peak Day	32°	14° −6° 31°	25°	3° 17° −10°	−3°
Lowest Temp. of Test Period	29°	8° −6° 26°	24°	−4° −9° −22°	−5°

At most, one-third of the connected load was operating at a given time

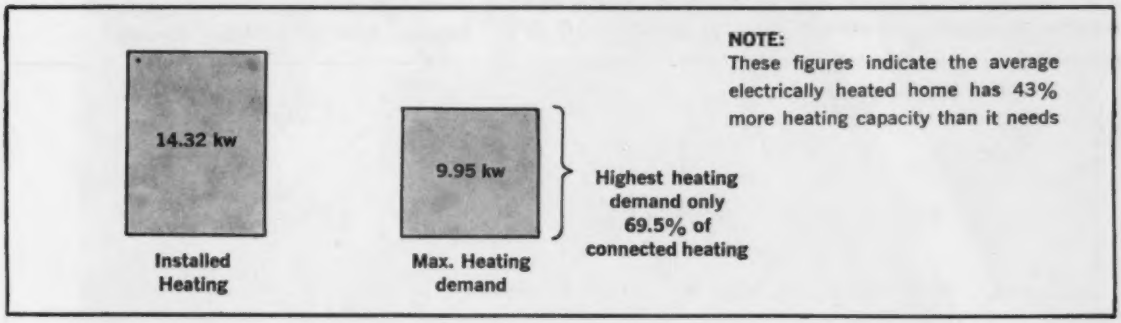

38.9 kw
14.32 kw
14.03 kw
Highest demand only 36% of connected load
Total Connected Load
Total Heating Load
Highest Total Demand
NOTE:
The highest hour-long demand was 12.47 kw; it did not occur at the same time as the 14.03 kw maximum demand.

the Five-company Heating Survey

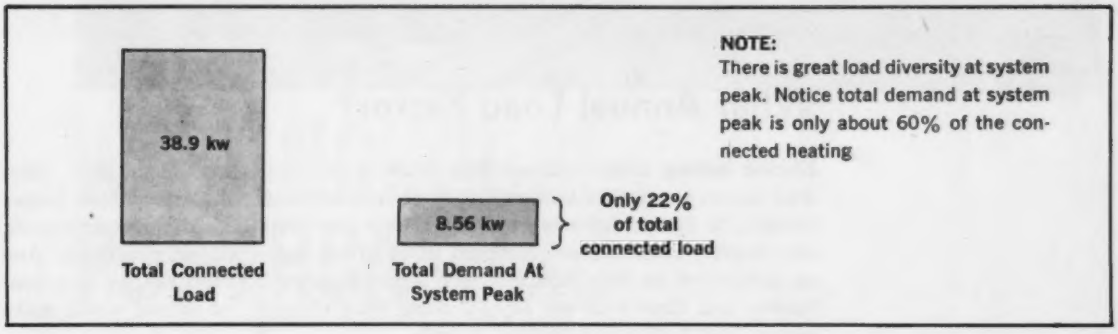
Capacity factor of installed heating during system peak	39.2%	Capacity factor of installed heating during max. heating hour	69.5%
Contribution of heating to house maximum hour load	54 %	Contribution of heating to house demand during system peak	65.5%
Ratio of heating during system peak to heating load's max hr	62 %	Ratio of non-htg. during system peak to non-htg. load's max hr	52 %

That Shows Its Conclusions

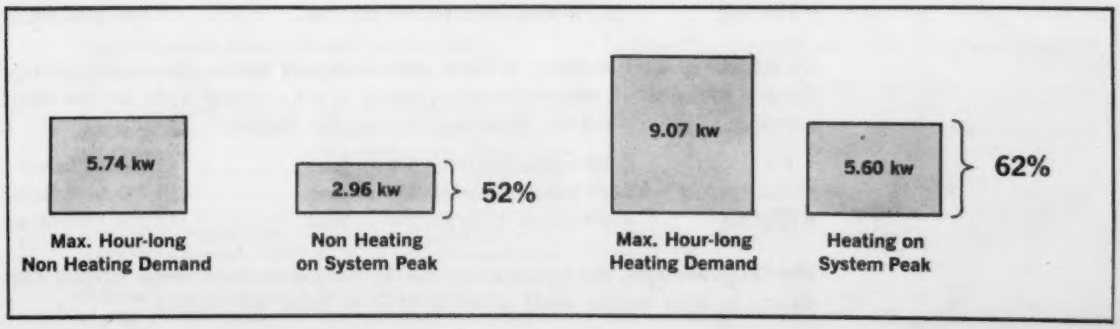
While up to 70% of the connected heating was on at a given time


14.32 kw
Installed Heating
9.95 kw
Max. Heating demand
Highest heating demand only 69.5% of connected heating
NOTE:
These figures indicate the average electrically heated home has 43% more heating capacity than it needs

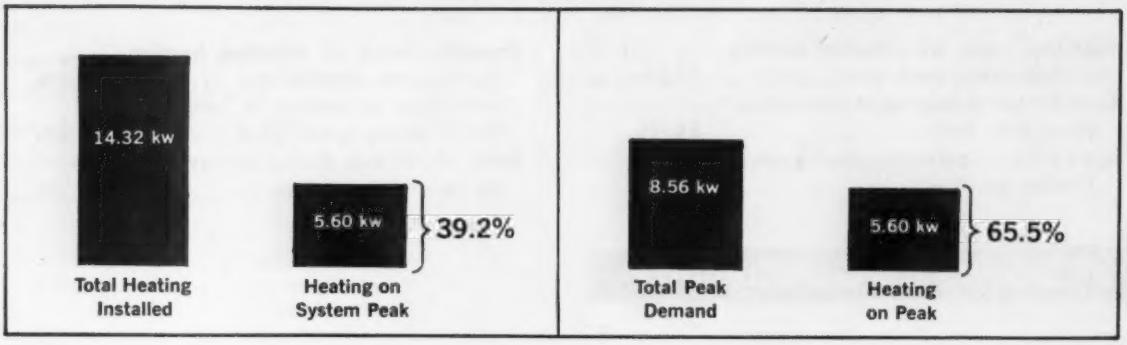
But only 22% of connected load was operating during system peak


38.9 kw
Total Connected Load
8.56 kw
Total Demand At System Peak
Only 22% of total connected load
NOTE:
There is great load diversity at system peak. Notice total demand at system peak is only about 60% of the connected heating

Demands during system peak were only about half their maximum at other times



During system peak, about two-thirds of the home's demand was heating—but only 39% of the installed heating was operating



Surprisingly, the percentage of heating during system peak did not necessarily increase as the weather got colder (figures are for 10 WWP homes, and one Idaho home)

	WWP								IDAHO			
Date	1/14	15	16	17	18	19	20	21	1/14	15	16	17
Min. Temp.	9°	20°	−3°	0°	−3°	0°	2°	12°	17°	9°	−9°	1°
% Ht. on System Peak	71%	63	72	72	69*	74	73	75	73%*	88	60	73

*System Peak

What Annual Load Factor?

Electric heating critics can find little cheer in the study's load factor data. Poor load factors for electric heating simply weren't substantiated. Annual load factors couldn't be figured for every company, since non-heating kwhr use wasn't available in every case. But one company in the group had all the data required. And an analysis of its data indicates very little difference between heating and non-heating load factors for the average home (load diversity, of course, would make system load factors considerably higher).

- Total load — 3300 annual kwhr per kw on peak.....37.7% load factor
- Non-heating — 3311 annual kwhr per kw on peak.....38.3% load factor
- Heating — 3281 annual kwhr per kw on peak.....37.4% load factor

To test the general accuracy of these single-company figures, the study's average demand ratios for all companies were applied to the expected kwhr for the single company. This showed the following encouraging results:

- Total load — 3680 annual kwhr per kw on peak.....42% load factor
- Non-heating — 3480 annual kwhr per kw on peak.....39.7% load factor
- Heating — 3780 annual kwhr per kw on peak.....43.2% load factor

The study averages, the report notes, can be applied in like manner to local conditions in other service areas to arrive at load factor information.

WESTINGHOUSE POWERCASTING*

probes four promising new power sources

Direct conversion methods promise high efficiency, low capital cost per kw

It is a certainty that the electric utility industry will utilize sources of power beyond conventional steam generation . . . and within the predictable future. For this reason, Westinghouse has for many years been engaged in an intensive program to develop methods of producing electric power by direct conversion. This program is broad front . . . all known possibilities are being investigated. Each of 38 Westinghouse laboratories is working on some phase of the problem. Many of these investigations are being initiated from a fund of pure knowledge gained through—and possible only because of—Westinghouse year-in, year-out program of basic research.

Development of advanced methods of power generation is being carried out to reduce, still further, the cost of generating electricity. They are being developed through the continuous search for economical generation for the future.

Four of these future power sources, Westinghouse believes, are standout possibilities . . . the fuel cell, thermionic, thermoelectric and magnetohydrodynamic generators.

*A Service-Mark of Westinghouse

YOU CAN BE SURE...IF IT'S Westinghouse

WESTINGHOUSE POWERCASTING* foresees efficiency gains up to 80% for fuel cell...challenges role of steam turbine-generators

2 TO 1, YOU'LL HAVE ONE OF THESE NEW POWER SOURCES ON YOUR SYSTEM

Fuel cell base load generator potentially twice as efficient as today's turbine-generator

The fuel cell probably will be able to produce twice the power, per unit of fuel, as today's most efficient steam generator. This staggering potential has prompted an intensive effort at Westinghouse to develop this system.

The energy released by the chemical reaction between a fuel and an oxidant is converted directly to electrical energy by the action of the fuel cell. The simple picture of a cell mechanism is an electrolyte sandwiched between two electrodes. An oxidant—usually oxygen—is supplied to one electrode where oxygen ions are formed. The ions move through the electrolyte to the second electrode where chemical combination occurs with the fuel. Electric power is obtained by connecting a load between the electrodes.

One prime reason for considering the fuel cell as a potential replacement for steam generation is the elimination of moving parts. Another is that efficiency is independent of the size of cell over a wide range of power output. The same fossil fuels can be used more efficiently and without the necessity of a heat cycle.

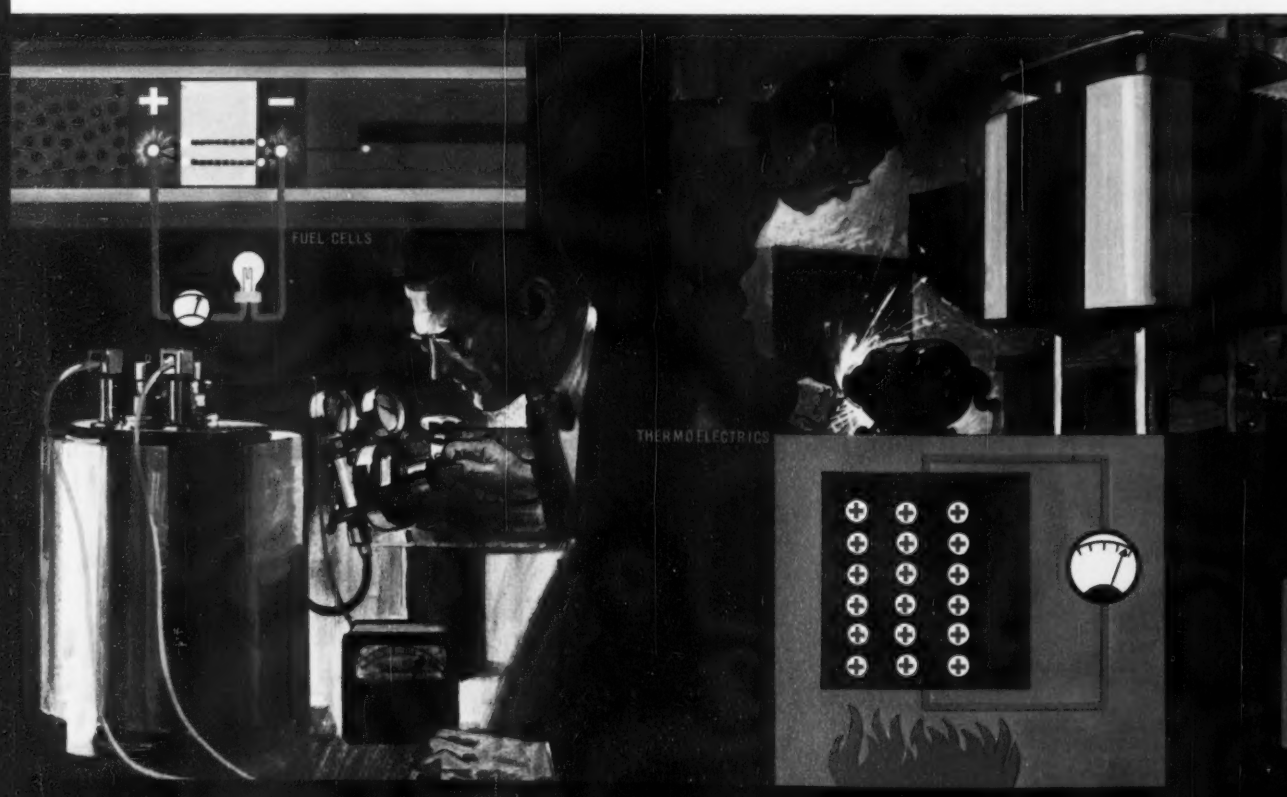
Today, materials do not exist for electrode and electrolyte which are at once resistant to high temperature corrosion, are highly conductive, yet low in cost. Westinghouse is attacking these complex materials problems. Because of this major effort, a new power source, within 15 to 20 years, may be available to you.

Thermoelectric peaking generator predicted for 1970's

Practical, economical thermoelectric power is a predictable generation opportunity within 20 years.

The thermoelectric effect occurs when heat is applied to one end of some materials . . . negative charges move to the cold side, the positive do not. In other materials, the opposite reaction will take place. Connected in series, these materials form a thermocouple. Electrical efficiency depends upon the ability of the materials to maintain temperature differential, on one hand, and substantial electron flow, on the other.

Studies have proved that semiconductors, half way between best insulators and best conductors, are the most efficient thermoelectric materials. Westinghouse



is currently conducting massive research among the hundreds of thousands of possible semiconductors to "build" optimum materials. To obtain high efficiency, thermoelectric conductors must be operated at high temperatures. In the quest for ideal alloys, the best materials Westinghouse has developed to date are 17% efficient. Based on present knowledge of materials, efficiencies to 30% are expected within 5 years. Breakthroughs to 50% or even higher values are not improbable.

A thermoelectric generator might well be constructed of many thermocouples in series, on a cylinder, for example, and fired by either fossil or atomic fuels. Large-scale devices face problems of corrosion, thermal and electrical insulation, heat and radiation dissipation, mechanical stresses. While problems are in almost fantastic variety, Westinghouse is attacking them all . . . with substantial progress in their solution.

The efficiency of thermoelectric devices is already competitive with small heat engines and is expected to improve rapidly. By 1970, Westinghouse expects to be able to build a 20% efficient, 100-megawatt generator for utility peaking service.

Thermionic topping unit can raise nuclear plant efficiency 55%

The third important Westinghouse development promising economic production of power by static equipment is the thermionic generator.

A thermionic power converter is essentially two conductive plates in an evacuated chamber. As heat is applied to the first plate, electrons are "boiled out" and flow to the second plate. This produces an electric current. The higher the temperature, the higher the efficiency of this generator.

Realization of a competitive thermionic device depends upon materials that can withstand high operating temperatures and maintain a low evaporation rate with high electron emitting capacity.

Looking ahead, Westinghouse sees this generator as a topping unit for a nuclear steam plant, taking advantage of high temperatures available. An atomic plant, at 27% efficiency, plus a thermionic plant, at 20%, offers an over-all efficiency of 42%. Efficiency of the thermionic device itself may theoretically climb to 50 or 60%, may cut up to one mil in fuel costs per kwhr.

10-kw fossil-fueled magnetohydrodynamic generator—largest in the world—foretells 380-mw equipment at 60% efficiency

Magnetohydrodynamics is the concept of generating electric current by forcing a gaseous conductor through a magnetic field.

Heated, ionized gas is passed through a magnetic field. Free electrons flow to an electrode at the top of the field, through a load to another electrode at the bottom of the field, creating a current. An ionized gas, at 4000°F, is used as fuel. Its velocity is between 2000 and 4000 miles per hour through a combustion chamber inside the magnetic field. The gas functions the same as rotating copper through a conventional generator.

Westinghouse is pointing toward magnetohydrodynamic generators ranging above 100 megawatts, using an atomic reactor to heat the gases to perhaps 4200°F. Calculations on a 380-mw design, for example, disclose a possible, practical operating efficiency of 60%, a reduction in fuel costs of possibly 1¼ mils per kwhr. A variation of this large-scale generator might burn fossil fuel, the combustion products passing through the system.

What are the problems presently standing in the way of an economical, commercial-size unit? Temperatures for these systems start at 3500°F. New magnetic and electrode materials must be developed which will maintain structural strength for 20 years above these temperatures. These materials must contain the gases under extreme temperatures at velocities up to 4000 mph . . . without adverse chemical reaction. The problems are impressive . . . but so is the plan to conquer them. A broad and definite program of research and development may one day enable Westinghouse to offer you a completely proved, highly efficient magnetohydrodynamic generator.

*A Service-Mark of Westinghouse

YOU CAN BE SURE...IF IT'S Westinghouse

WESTINGHOUSE POWERCASTING* develops new concepts of power system planning, equipment for economical industrial growth

Westinghouse Powercasting is a continuous plan of action devoted to the stable growth of the electric utility industry. Toward this end, Powercasting has created a method of predicting your future system needs accurately. Concurrent with this activity, Westinghouse carries on a program of product development for generation, transmission and distribution, geared to the needs of the industry's future systems.

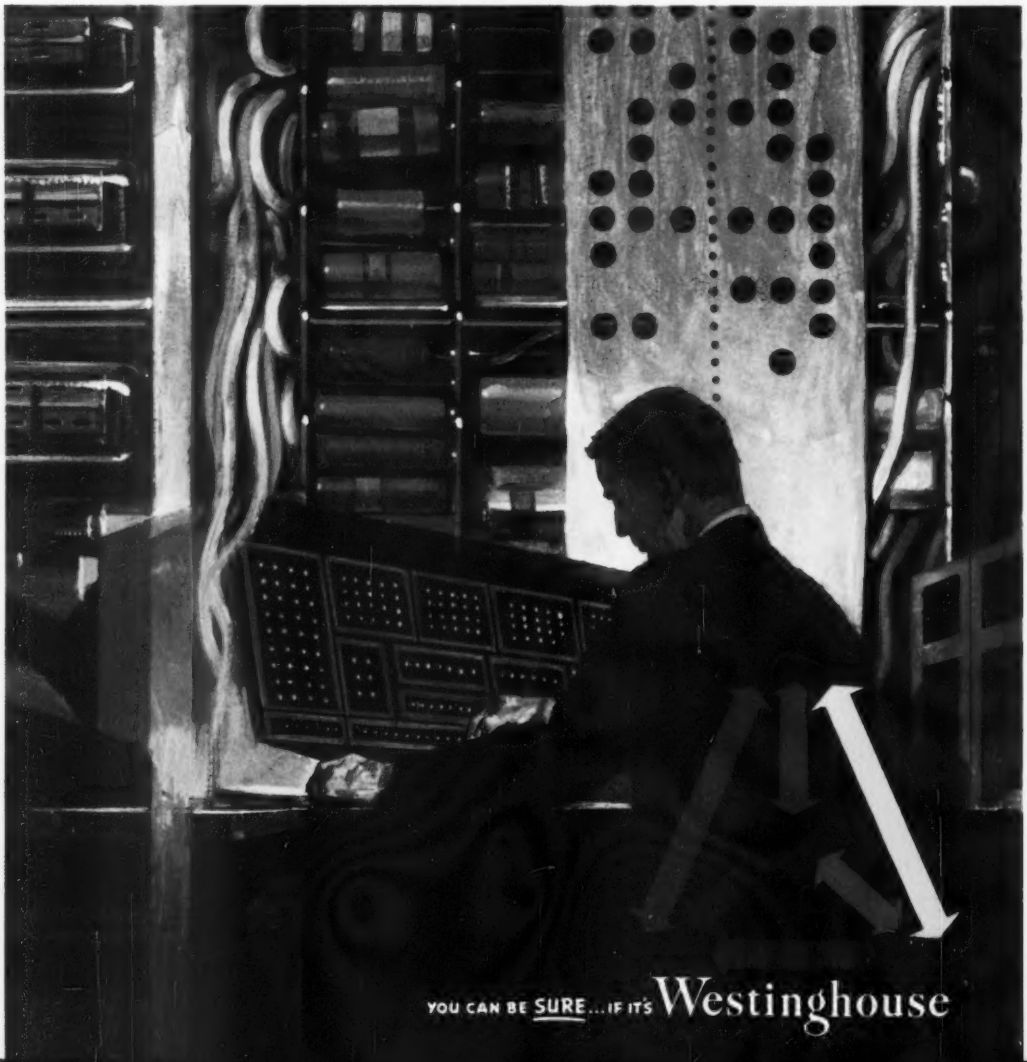
One area of research receiving intensive attention is direct conversion generation, discussed on these pages. These power sources are potentially more efficient than steam generation—some by a wide margin. Capital costs are potentially lower. Any or all of these plants may one day fill new, cost-saving roles on your system. While foreseeable improvements in the steam plant may cut ⅓ mil from fuel costs, the fuel cell, for example, may reduce these costs by as much as 1¾ mils. As a base load generator, this device alone could mean per annum savings of hundreds of millions of dollars to the industry.

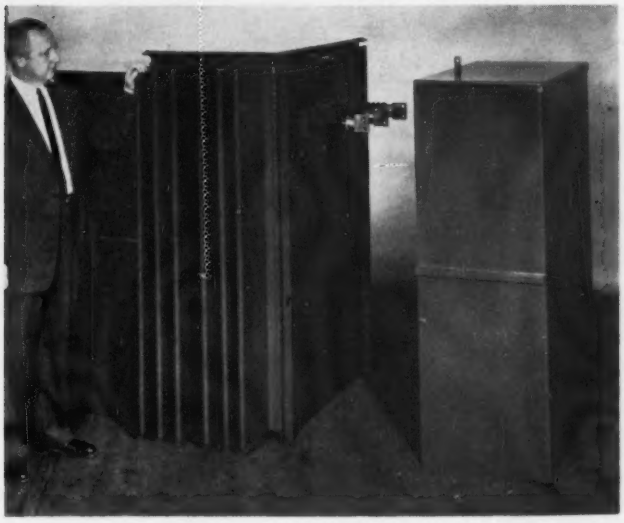
Concurrent with this broad-based product development, Powercasting is setting up system planning guideposts for the application of revolutionary new equipment. It is the task of Powercasting to be prepared for major breakthroughs . . . to determine which power sources will be most economical, when, in what sizes, and in what type of service on your system. Capital outlays, operating costs, transmission and distribution requirements and new areas of product development must also be analyzed. Altogether, to develop sound concepts of power system expansion and operation, Westinghouse Powercasting searches the entire field of the fundamental sciences for new knowledge, new ideas.

For more information about future power sources, get in touch with your Westinghouse representative.

CP-1057 Litho in U.S.A.

*A Service-Mark of Westinghouse

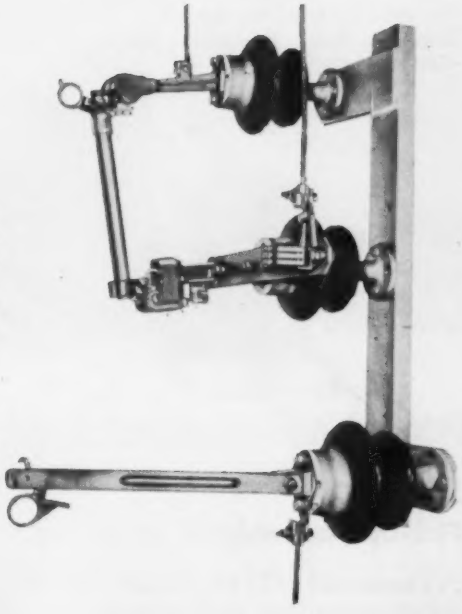




Transformer . . .

. . . for pad mounting is designed for heavy low-voltage load concentration, such as is found at shopping centers and hotels. High and low-voltage dry-type enclosures accommodate either cable or buses. Available 3-phase ratings are 225 to 1,500 kva, 2.4 to 13.8 kv primary without taps and 120/208Y or 277/480Y secondary.

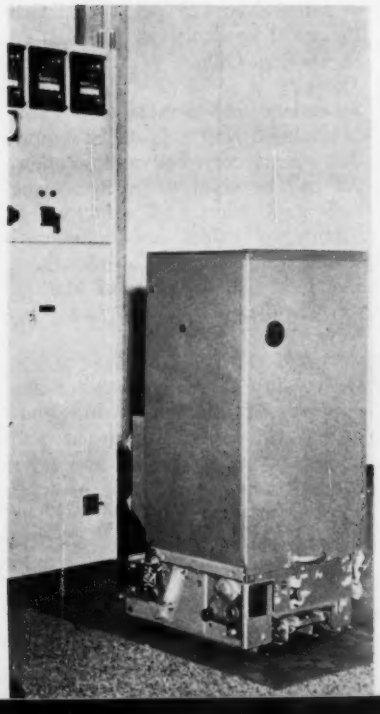
Allis-Chalmers Mfg Co, Milwaukee 1, Wis.



Switch-Fuse Unit . . .

. . . serves as a bypass for an oil circuit recloser when installed in conjunction with a conventional disconnect. This combination also provides for isolation of the recloser and fuse protection while the recloser is disconnected. The type BLP bypass switch is available in ratings of 7.5, 15 and 23 kv, 100 and 200 amp continuous for fuses, 200 amp for switches.

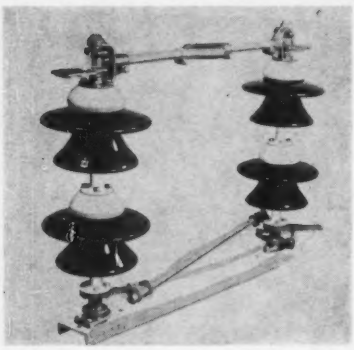
A. B. Chance Co, Centralia, Mo.



Switchgear . . .

. . . has been redesigned to improve speed of interruption and of contact-closing. Faster closing is accomplished by the stored energy of springs. Elimination of iron from the magnetic field for arc blowout has reduced the weight. The breaker can be placed in any of three positions within the compartment without opening the door.

I-T-E Circuit Breaker Co, 1900 Hamilton St, Philadelphia 30, Pa.



Switch . . .

. . . is braidless and opens at its center. Both insulator stacks are rotated to operate the type GG side-break switch, furnished in ratings from 34.5 to 161 kv, 600 and 1,200 amp. It is corrosion resistant and has good ice-breaking capability.
Southern States Equipment Corp, Hampton, Ga.

Pick-Up Assembly . . .

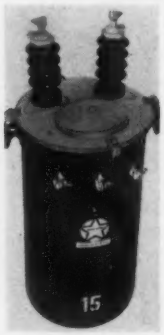
. . . for circuits to 14 kv puts out a voltage proportional to the current in a wire lashed in the top groove. The model S467-1 assembly comprises an induction coil housed in a post-type insulator. Ratio is 1 v to 60 amp, linear to 5,000 amp.
Fisher-Pierce Co, 42 Pearl St, South Braintree 85, Mass.

Demineralizer . . .

. . . tests steam condensate. It first removes volatile amines, then detects salts by a conductivity meter. Model BD-2 Bantam, 4½ in. in dia and 20 in. high, uses a disposable cation resin cartridge and needs no regeneration.
Barnstead Still & Sterilizer Co, 7B Lanesville Terrace, Boston 31, Mass.

Transformer Cover . . .

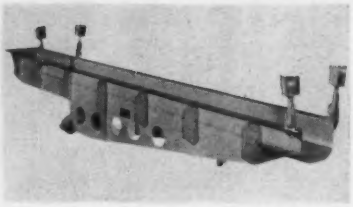
. . . is insulated to prevent outages that happen when birds or small animals make contact between bushing terminal and transformer cover.



The cover is coated with polyvinyl chloride, which is sky blue for ready identification. The insulating finish is also corrosion-resistant and can cover a whole transformer.
Pennsylvania Transformer, Box 330, Canonsburg, Pa.

Trencher . . .

. . . for one-man operation can dig 5½ ft deep. The Trench-Devil L-12 can dig trenches 4 to 12 in. wide; it can also be set for lesser depths and for forward or reverse speeds from 0 to 1,200 ft per hr. It deposits dirt on either side.
Arps Corp, New Holstein, Wis.



Vibrating Conveyor . . .

. . . moves coal of any size from 5-in. Egg to ⅜-in. Slack. The conveyor, which is made entirely of iron and steel, has a pneumatic vibrator unit below its tray. The equipment can be hung, as shown, or can rest on floor springs.
Cleveland Vibrator Co, 2828 Clinton Ave, Cleveland, Ohio.

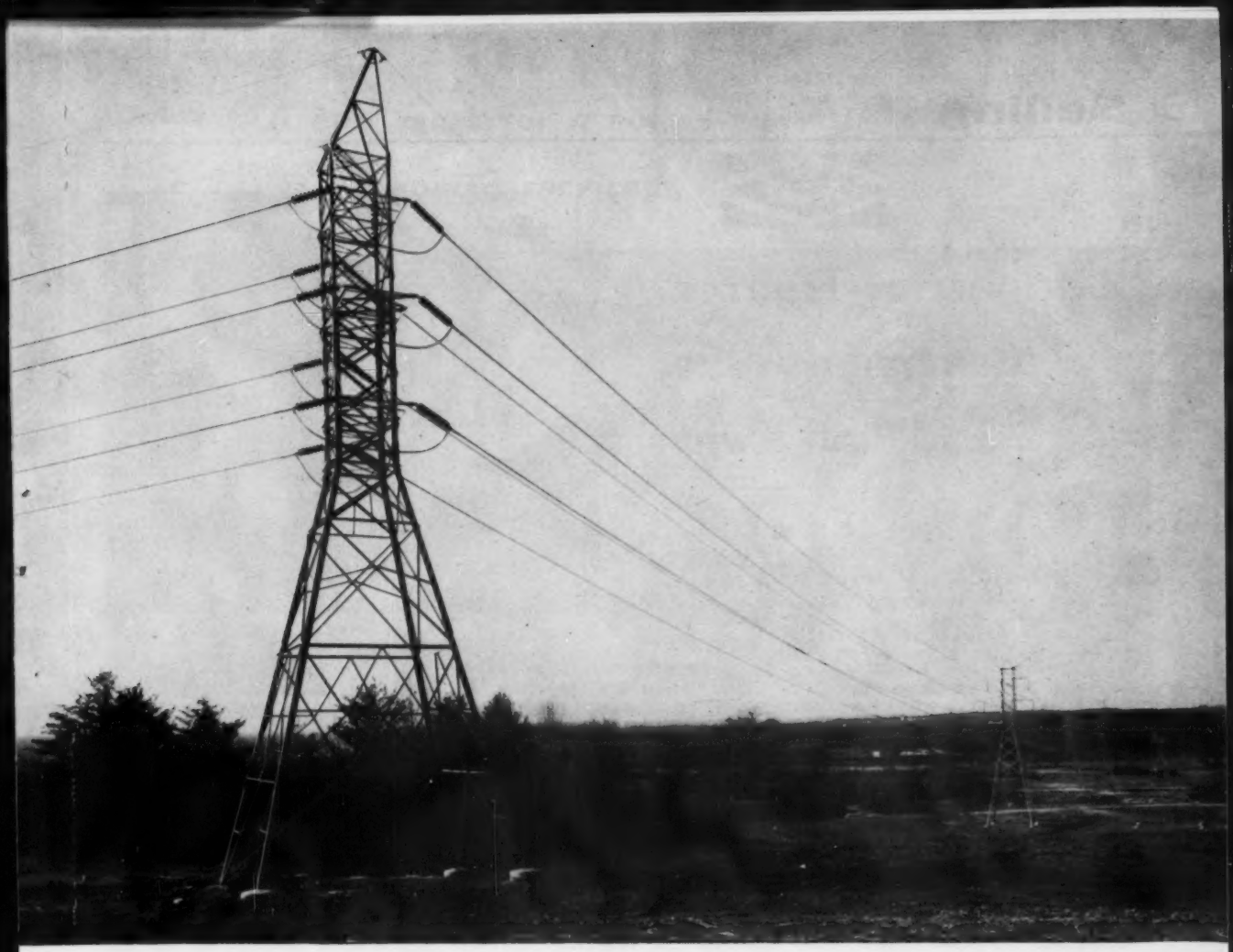
More New Products

Heat shrinks **polyolefin tubing's** diameter so that the tubing fits tight over solid materials. Hyshrink has high dielectric and mechanical strength and it resists most chemicals.—Sequoia Wire & Cable Co, 2201 Bay Rd, Redwood City, Calif.

Multipole-pole **rotary switch** with 1 to 25 sections, each with 8 positions, can be panel or base-mounted. The type 2300 switch is rated 15 amp at 125 v ac and more than 5 amp at 240 v ac or 125 v dc.—Standard Electrical Products Co, 2240 E 3rd St, Dayton, Ohio.

Secondary and service-drop cable is insulated with a synthetic rubber that resists corrosion and weather, yet can be colored for identifying individual wires. Conductors of Compresto cables are compacted stranded aluminum. — Southern Electrical Co, div of Olin Mathieson Chemical Corp, 460 Park Ave, New York 22, N. Y.

Heavy-duty **lever limit switch** for cranes and hoists is readily adjusted with only screwdriver and wrench to many contact and lever combinations. A selection of actuating levers is offered for the IC9445 switch.—General Electric Co, Schenectady 5, N. Y.



86 tons of dead weight saved on light transmission towers

Since American Bridge first introduced the use of high strength steels in transmission towers, savings have been effected on scores of new transmission lines in all parts of the country. ☐ This new 110 KV double circuit line for Baltimore Gas and Electric is a typical example. By using both USS MAN-TEN and A-7 Carbon Steel to their best advantage, just over a ton of dead weight was trimmed from each of 86 towers, resulting in both material and handling savings. ☐ American Bridge, the world's leading transmission tower specialist, has recently designed towers to carry the highest voltages likely to be used for the next decade, and is currently engaged in developing a light, economical tower that will eliminate the need of surface protection and future maintenance. ☐ For recommendations based on your requirements, write American Bridge Division, United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

USS and MAN-TEN are registered trademarks

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American Bridge Division of United States Steel

USS

Refrigerator-Freezer Campaign Adds 2.3 Million Kwhr

UTILITY FLOOR DISPLAY was key part of Atlantic City Electric refrigerator-freezer promotion which sold 2,300 units in six weeks

An increase of more than 2.3 million kwhr per year was the score racked up by Atlantic City Electric Co in a six-week refrigerator-freezer promotion. And the 2,300 sales recorded amounted to 383% of the utility's original campaign quota.

The payoff in extra revenue is an estimated $25 per year from each of the 2,300 customers who bought electric refrigerator-freezers or freezers from "authorized dealers" during the campaign period, June 1 to July 15.

The utility was bucking a 98% saturated market in ordinary refrigerators but overcame this obstacle by stressing that customers were missing a "wonderful" opportunity by not replacing their old refrigerators with modern refrigerator-freezer combinations.

Atlantic City Electric based its promotion on the NEMA theme, "An Electric Refrigerator-Freezer Is a Supermarket in Your Kitchen." To dramatize the theme, the utility gave each purchaser a certificate redeemable for $25 worth of frozen foods at any store in the utility service area. Participating dealers received a five-dollar bill for each sale.

It wasn't until mid-spring that the utility decided to institute the campaign. At that time, said Fred Ellenberg, residential and farm sales director, "We were casting around for a good load-builder to promote when we came across a 'Report to Utility Executives' put out by NEMA. The report said that today's typical refrigerator-freezer represented 800 kwhr per year—an increase of 160%—over the ordinary one-temperature refrigerator now in use."

Ellenberg felt that the 800 figure, though impressive, was, if anything, conservative. He checked with a half-dozen manufacturers, and the figure he got convinced him that 1,000 extra kwhr per year was closer to the truth. This helped him make up his mind to go after that extra load.

Campaign Gets Underway

Within a few weeks, ACE had drawn up plans for a promotion that would tie in the 225 appliance dealers in the 2,700-sq-mile service area in southern New Jersey. The utility ordered direct mail and display material from NEMA, made up a fat promotion package for dealers, and was ready to go.

On May 17, Ellenberg presided at a breakfast meeting of appliance distributors and key personnel from the utility's 12 districts. This officially launched the campaign. Sales quotas were assigned for each district—a total of 600 refrigerator-freezers for all districts.

"Not having promoted refrigerators for 20 years, we had no idea what would be a realistic quota. We picked the number 600 pretty much out of thin air," Ellenberg said. "The district managers howled—after all, the market was supposed to be saturated."

But after the first few days of the campaign, the response was so terrific, the utility upped the quota to 1,500, and nobody complained.

A letter and the ACE promotion kit went to every dealer in the area. The utility offered all promotional materials free of charge. Particularly appealing to the dealers was the competitive advantage they got by being "authorized" to give away $25 frozen-food certificates.

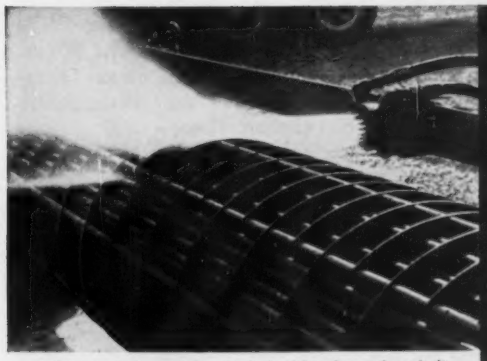
The promotion kit consisted of an 11x14-in. packet with the "Supermarket in Your Kitchen" theme on the cover, and on the back the NEMA invitation to dealers to "get your share of a billion dollars in refrigerator-freezer sales in '60." Components purchased from NEMA included three direct-mail folders and a large window streamer. Also included were sample frozen-food certificate, a glossy proof of the utility ad, and a list of 146 "approved" refrigerator-freezer models which qualified for the certificate.

The utility's covering memo to the dealer emphasized that the $25 certificate and the $5 dealer bonus applied only to true refrigerator-freezers on the "approved" list, and not to "ordinary" refrigerators with merely a frozen food section or compartment.

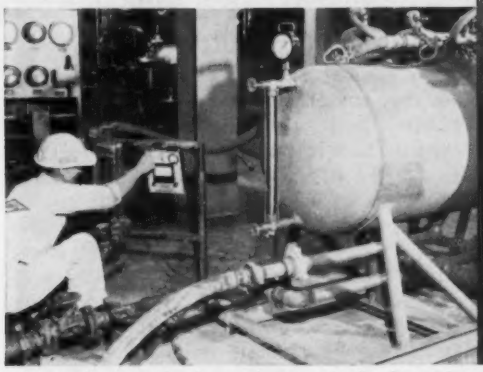
ACE always varies the details of

(*Continued on page* 96)

A new mark for a nation-wide cleaning service . . . DOW



Jetting tool cleans tubes fouled with coke and asphalt.



New mobile foam-cleaning equipment cuts cleaning costs.

Cleaning missile lines and components requires tolerances as close as 150 microns.

DOW INDUSTRIAL SERVICE

Industrial Cleaning. Dow Industrial Service, now a separate division of The Dow Chemical Company, offers the only nation-wide chemical cleaning service for virtually all types of industrial processing equipment. This is an expansion of the cleaning service developed over the past 20 years. Dow is currently servicing entire plants as well as doing special cleaning jobs for both large and small companies.

Dow Industrial Service research in industrial chemical cleaning has developed specialized mobile equipment and techniques, some of which are pictured above. These highly efficient techniques are improving plant productivity and reducing equipment downtime in all industries using steam generators, condensers, heat exchangers, towers, water and product lines, water wells and tanks, or similar process equipment.

Product Sales and Service. The sale of specialized chemical products, scientifically formulated to be of use in specific industrial processes and to give the necessary technical service in their use, is the job of Product Sales and Service. Purifloc* N17 is an outstanding new flocculant cleared by USPHS for use in potable water.

Laboratory Service. Because of the rapid development of chemical products for the municipal and industrial waste and water treatment areas, Dow Industrial Service will take on the service-selling of those products. Also, a consulting laboratory service for municipal and industrial waste and water treatment is provided.

You'll find Dow Industrial Service offices and stations with specialized cleaning equipment and experienced personnel in all major industrial areas. For more information, write to Dow Industrial Service, 20575 Center Ridge Road, Cleveland 16, Ohio. *TRADEMARK

DOW INDUSTRIAL SERVICE DOW *Division of THE DOW CHEMICAL COMPANY*

(*Continued from page* 94)
its cooperation with dealers from campaign to campaign.

In this one, the utility bought no advertising space cooperatively with dealers. The utility ran quarter-page ads in 47 dailies and weeklies, playing up the "Supermarket in Your Kitchen" theme, and advising readers they could get the $25 certificate by buying their freezer or combination unit at any authorized dealer.

The dealers in turn heavily advertised the free frozen food deal and got what Ellenburg calls "almost unprecedented support" from their distributors. Every one of the 10 members of NEMA's Household Refrigerator and Freezer Section tied in.

Special Freezer Clinics Held

Atlantic City Electric's Home Service staff ran special freezer clinics throughout the campaign. Open to the general public and advertised in space adjoining the utility's refrigerator-freezer ads, the clinics drew an average of 75 women at each session. Also, the home service women were instructed to inject mentions of refrigerator-freezers at group demonstrations for all appliances.

For the sake of good dealer and customer relations—and to ensure that the frozen food certificates were given only for refrigerator-freezers sold during the campaign—the utility had its home economists personally deliver each certificate to the customer.

The home economist told the customer that she had been asked by the dealer to make the call, to deliver the certificate, and to give the customer some helpful information about the use of her refrigerator-freezer.

To qualify as an "ACE Authorized Reddy Kilowatt Appliance Dealer," dealers are required to give at least 200 sq ft of floor space to major electric appliances, and display an identifying decal, supplied by the utility, on the window.

Other requirements: Service of appliances after the sale, participation "from time to time" in ACE promotions, and monthly reports to the utility on the number and type of electric appliances sold. ACE uses this information to evaluate results of its sales promotions.

The utility in turn agrees to advertise extensively to promote dealer sales; to keep a "Where to Buy It" list of dealers to which interested customers are referred; to provide home service personnel to help dealers with freezer, range and laundry demonstrations; and to hold educational and sales training sessions for dealer personnel.

Individual dealers used the "Supermarket in Your Kitchen" theme as a springboard to special promotional efforts of their own. Several dealers arranged tie-ins with local supermarkets. The market set up a floor display of one of the dealer's top-of-the-line refrigerator-freezers, with window streamers and placards announcing the $25 frozen-food giveaway. The dealer in turn featured display material advertising the market in his store.

Some dealers matched the utility's $25 certificate with an extra $25 in frozen food to purchasers of refrigerator-freezers. One dealer, who operates an asparagus farm on the side, gave away quantities of asparagus with instructions on preserving and preparing.

Summing up the results of the campaign, Ellenberg commented, "We feel that the success of this campaign explodes the theory that you can't sell to a 98% saturated market. The timing was especially fortunate in view of the growing momentum of gas refrigerator promotion. Besides upping our refrigerator load, we feel we saved the future electric refrigerator-freezer market from inroads by the competition."

ACE definitely plans to run a refrigerator-freezer campaign in 1961.

EEI Booklet Stresses Home Service Career

An aid to electric utilities in attracting new home service personnel has been published by Edison Electric Institute.

The booklet, "Your Invitation To A Career As A Home Economist With An Electric Utility Company" is designed to promote careers in home service and can be used as a hand-out piece to high school and college home economics classes.

Price: $2.50 per 100, 10% additional to non-members of EEI. Minimum order, 100. Write: Sales Department, EEI, 750 Third Avenue, New York 17, N. Y.

Electric Heating Chosen By 97% of Home Buyers

Ninety-seven percent of the new homeowners in a Missouri subdivision have chosen electric heating. All homes are Westinghouse Total Electric Homes.

All owners of the 154 homes were given their choice of electric heating or conventional fuels.

As a result of this swing to electric heating, the builders plan another subdivision of 650 similar homes on an adjoining tract.

Illinois Power Attacks Bad Kitchen Planning

Many homemakers have been complaining about the lack of equipment, common sense and imagination in their kitchens.

Illinois Power Co is attempting to remedy this situation in its area through a Golden Award Kitchen program. The goal is to encourage architects, builders and planners to construct new, or modernize existing, kitchens.

Four basic requirements have been established:

1. A good triangle of work between the three appliance centers, and freedom of traffic in work areas;

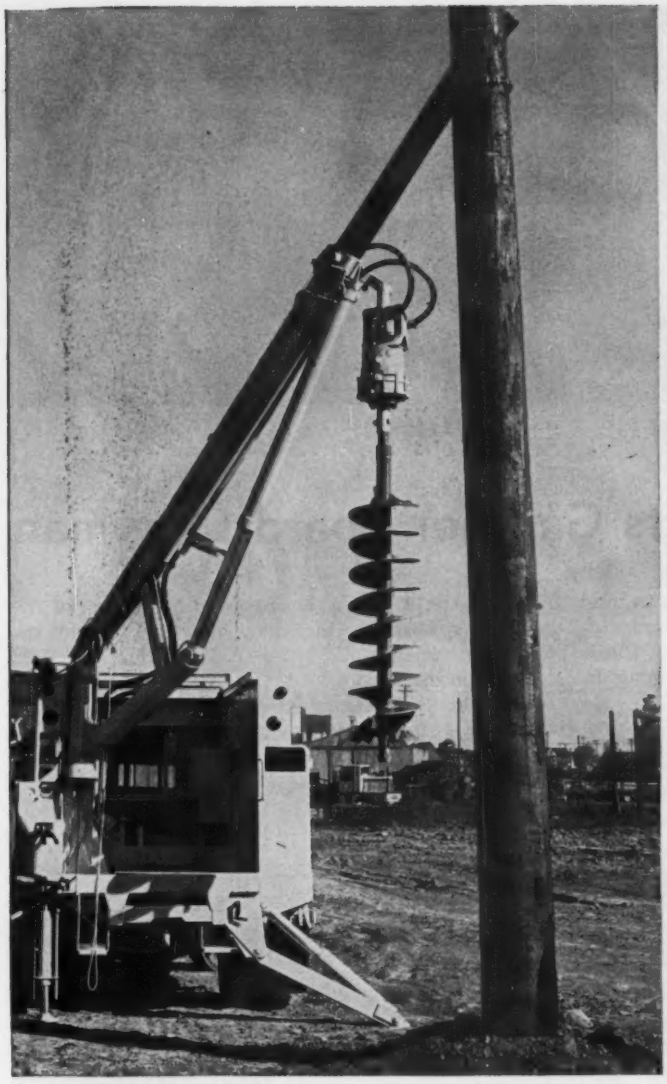
2. An adequately sized kitchen, based on family needs and activities;

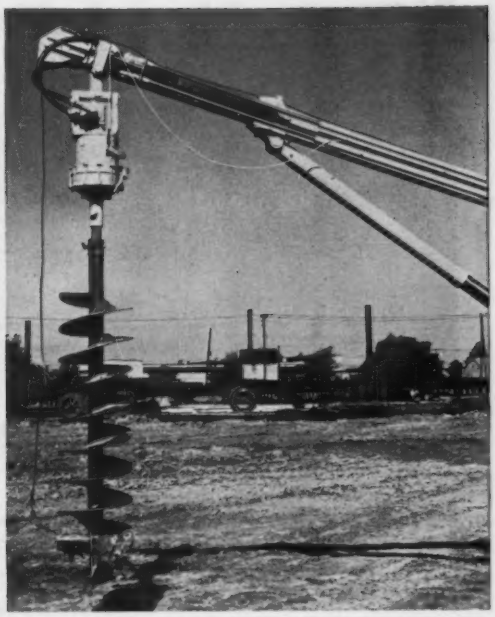
3. Systematized storage plus good working heights with sufficient working counter space;

4. Use of a range, dishwasher, disposer, combination refrigerator-freezer, or separate units conveniently located, Light for Living, and Certified Adequate Wiring.

Award winning kitchens can be in homes where existing kitchens are remodeled or in Gold and Bronze Medallion Homes.

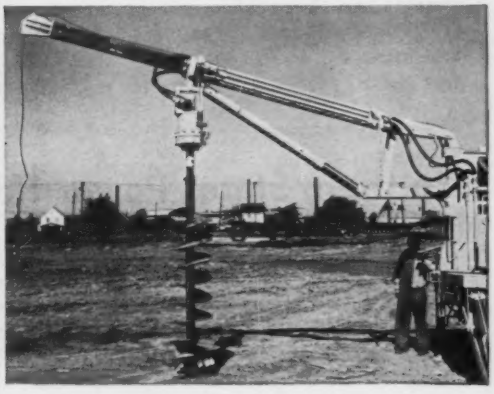
A certificate and a Golden Award clock will be given to owners of homes meeting the established standards. A replica of the certificate will be given to participating builders, architects and kitchen dealers. After working on ten Golden Award Kitchens, a plaque will be awarded to builders or dealers.





Semi-automatic device locks borer on end of extendible boom for digging.

Borer automatically locks to end of main boom when retracted, leaving extendible boom free for pole setting.



Diagnosis: High Feed Pressure

Strongest corner-mounted derrick in the field is Holan's 7500 — a powerful, time-saving derrick that operates in an arc behind and to the right side of the truck.

Here's power . . . real power . . . all the up and down feed pressure needed to drive any derrick-suspended digger. And more than that, it's the only corner-mounted derrick built capable of handling Holan's rugged 3-speed 5400 Earth Borer.

Jobs can go ahead on schedule — even in alleys, narrow streets and congested areas because positioning problems are ended. Parked parallel to the curb, the 7500 swings over . . . even over fences and guard rails . . . reaches out . . . and digs deep holes, sets poles up to 70 feet in length.

The 7500 is engineered as a complete unit to avoid body and derrick stresses . . . can "live boom" 8,500 pounds, winch 10,000 pounds.

A semi-automatic locking device moves the earth borer onto the extendible boom for digging . . . or to its main boom storage position.

The 7500 . . . shown here mounted on the left side . . . is available mounted on the right side. It reaches up 27'-6", 18½' behind the truck, and beyond the right side 12'-3" (left-side mount) and 16'-10" (right-side mount) with boom extended.

Before you buy any corner-mounted derrick, write us — or call your Holan Field Representative — for complete details.

Holan Corporation, 4100 West 150th Street, Cleveland 35, Ohio
Plants in: Cleveland, Ohio; Griffin, Georgia; Phoenix, Arizona

Holan

Subsidiary of THE OHIO BRASS COMPANY

HOLAN

GARDNER JOHNSON PEARSON ALLEN

Nevada Utility Elects Gardner Board Chairman

Reid Gardner, president and general manager, has been elected chairman of the board of directors of Southern Nevada Power Co. Also elected were: Elmer F. Johnson, assistant general manager; and Arthur E. Pearson and Harry Allen, vice presidents.

Gardner will continue to serve as president and general manager. In the utility field since 1924, Gardner was elected president and director of Southern Nevada Power in 1954. He is in charge of all phases of the company's business, including financing, operations, and construction.

Johnson has been a vice president since 1958. Pearson joined the company in 1956 as treasurer. Allen has been with the company since 1946, and most recently was executive assistant in charge of personnel and purchasing.

Northern States Power Names VP-Operations

Oakley N. Dean has been promoted to vice president-manufacturing of the Exide Industrial Division of The Electric Storage Battery Co.

Dean joined the company in 1949 and was appointed successively assistant superintendent, assistant to the general superintendent, and assistant general superintendent. In 1955 he became manager of Exide's Philadelphia manufacturing operation, the post he now relinquishes.

Before joining Exide, Dean was with the Willard Storage Battery Co of Canada, Ltd, Toronto, Electric Storage Battery subsidiary, where he was a sales engineer and technical assistant to the vice president.

Dean Is Appointed Vice President-Manufacturing

Northern States Power Co of Wisconsin has named W. N. Marx vice president in charge of operations, succeeding the late E. H. Cotton.

Marx has been with the company 31 years, since he joined as a draftsman in the engineering department in Eau Claire. Except for five years' military service, Marx was in that department until 1947 when he transferred to the construction department in Minneapolis as superintendent of transmission construction.

Since 1952 he has served as general superintendent of the Sioux Falls Division, then manager of the Southwestern Division, and most recently as manager of the Sioux Falls Division.

(*More News About People on page* 100)

Distribution costs greatly reduced by EBASCO planning

Wherever Utility Companies have called on EBASCO engineers for help in planning expansion or reconstruction of distribution systems . . . costs have been reduced, efficiency materially increased.

How does *your* system look in terms of present needs? Of future requirements?

EBASCO offers you long-range *or* interim planning services based on over 50 years' experience in finding economical solutions to the problems of the electric utility industry. EBASCO analyzes your system minutely, starting with customers and load growth. EBASCO engineers make their recommendations—based on practical world-wide experience—as to voltages, service continuity, and location and capacity of substations and circuits. Their thorough knowledge of methods and equipment provides invaluable assistance in comparing investment and operating costs.

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Forrest Named a VP Of Burns & Roe

Melbourne A. Forrest has been named a vice president of Burns & Roe. He will continue to be responsible for the company's operations

in power, nuclear, and industrial facilities.

Forrest had been assistant to the executive vice president, director of the Executive Engineering Division, and director of the Power and Industrial Facilities Division. He was formerly with Consolidated Edison.

Mallory Named President Of P. R. Mallory & Co

G. Barron Mallory (photo) has been named president of P. R. Mallory & Co, Inc. He succeeds Joseph E. Cain who was elected chairman of the executive committee. Charles A. Barnes has been named vice president-finance, and Leon Linn, who heads the Metallurgical and Mechanical Group, has been named a vice president. Kenneth W. Shearer was elected controller, and Paul M. D. Harrison, assistant secretary.

Mallory had been administrative vice president since October, 1958.

Hanlon Named President Of Royal Electric

George A. Hanlon has been made president and chief executive officer of Royal Electric Corp, a subsidiary of International Telephone & Telegraph Corp. He had been with General Electric Co for 24 years.

In his new capacity he will direct IT&T's domestic wire and cable facility.

Marcus Elects Farris VP-Engineering

Edgar A. Farris Jr has been elected vice president in charge of engineering of Marcus Transformer Co.

Prior to his promotion he was chief engineer. He joined the company in 1956, and before that was with I-T-E Circuit Breaker Co, and Standard Transformer Co.

PERSONAL BRIEFS

Detroit Edison Co has elected three assistant vice presidents: **Marshall Pease,** manager of purchases and real estate, reporting to Vice President Chester F. Ogden; **Howard R. Stevenson,** sales manager, reporting to Vice President Edwin O. George; and **Harvey A. Wagner,** system development manager, reporting to George A. Porter, vice president in charge of engineering, operations, and construction. The following promotions have been made: **Lemore W. Clark,** operations manager, succeeding **William W. Williams,** retired; **Robert M. Van Duzer,** assistant operations manager; **Albert C. Pasini,** general production superintendent; **Clarence H. Clark** and **John R. Hamann,** assistant general superintendents of production; **Oslin D. Whiddon,** assistant superintendent of the Enrico Fermi Atomic Power Plant; **John D. Starkweather,** power plants technical engineer; **Walter S. Tierney,** plant operations engineer; **R. W. Hartwell,** assistant manager of system development.

Howard M. Crinklaw has resigned as manager of Quinault, Wash., Light Co to accept a similar position with the City of Nome, Alaska.

San Diego Gas & Electric Co has made the following personnel changes: **E. C. Saunders** to the newly-created post of customer accounting manager; **R. R. Connors,** data processing supervisor; **C. D. Stewart,** tabulating supervisor; and **George Couvrette,** acting paymaster, until October, when he will become paymaster, succeeding **W. P. Burkhardt,** retiring. The company has made the following appointments to its reorganized Operating Division: **Walter A. Zitlau,** manager—production and transmission; **Joseph F. Sinnott,** manager—engineering; **C. Peter de Jonge,** manager—distribution; **Carthrae M. Laffoon** and **William A. Davis,** mechanical engineer and chief design engineer, respectively.

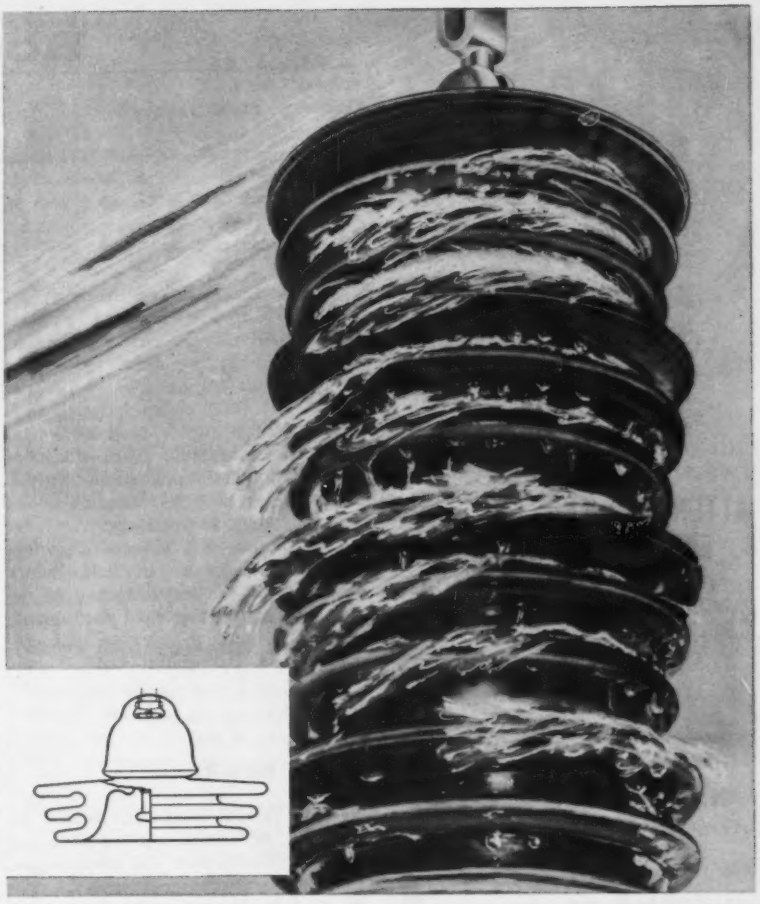
Westinghouse Electric Corp has named **Donald J. Povejsil,** director of new product services, and **Earl S. Goodwin,** director of corporate purchases. **Carroll V. Roseberry,** vice president in charge of the midwestern region has been awarded

the company's Order of Merit. Two of the company's atomic power officials have been named to the board of directors of the American Nuclear Society. They are **John W. Simpson,** vice president and general manager, Atomic Power Division, and **Dr William E. Shoupp,** technical director, atomic power department. **Carl E. Cannon** has been appointed product sales manager for electric heating for Westinghouse's Air Conditioning Division; and **Stuart L. Forsyth,** formerly electric heating product manager has joined Montgomery Brothers, Inc, western representative for Edwin L. Wiegand Co.

The publications and industrial press and advertising departments of the Industries Group at Allis-Chalmers Manufacturing Co have been combined into a single advertising department. **J. W. Murphy** has been named manager, **A. R. Tofte,** assistant manager. Within the department, **J. L. Black** was named manager of the publications section; **H. A. Reinhard,** manager, promotion services section; **D. A. LeRoy,** manager, industrial equipment advertising; **L. C. Doelger,** manager, utility equipment advertising; and **T. P. Doyle,** media supervisor and budget co-ordinator.

William M. Terry Jr has been put in charge of the electrical departments, in the Industrial Equipment Division, and **George A. Saar,** head of the mechanical departments. **Edward J. Kleine** has been assigned to the regulator department as an application engineer, and **Gerald Lesiecki,** as assistant engineer in the compressor department. Allis-Chalmers has appointed **Glenn J. Kangas, Thomas J. McDonald, Robert K. Stiles,** and **Lloyd E. Vlies** to the nuclear power department.

Other appointments: **S. C. Bielawski,** to West Allis Works purchasing agent, Industries group; **D. E. Bender,** assistant purchasing agent, electrical section; **W. M. Johnson,** manager, utility section, St. Louis district; **Wilson O. Vaughn,** manager, Baltimore district, industries group; **G. H. Carden** to Richmond as sales representative; **Russell A. Erickson** and **R. F. Kinney** as sales representatives to the Dallas district and Albuquerque branch office, respectively; and **Charles S. Knox,** coordinator, data processing, Comptroller's Division.



Delta-Star Fog-type insulators can be cleaned from one side, cutting maintenance costs

The unique undercut in the petticoats of the Delta-Star "Fog-Type" Insulators causes the water to swirl completely around the unit. This means that cleaning can be accomplished quickly and easily by squirting from *one side only*, cutting maintenance costs substantially. In addition, the Delta-Star insulator contour promotes natural cleaning by rain.

Wherever fog or industrial contamination is a serious problem, Delta-Star "Fog-Type" Insulators are the answer to increasing flash-over values. Leakage distance is 50% greater than that of conventional insulators, and *effective leakage distance* is also increased by the greater freedom from conductive contamination.

Delta-Star "Fog-Type" Insulators are available in either ball and socket or clevis and pin types. For complete information on these maintenance saving insulators, write *Delta-Star Electric Division, H. K. Porter Company, Inc., 2437 W. Fulton Street, Chicago 12, Illinois.*

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PORTER SERVES INDUSTRY with steel, rubber and friction products, asbestos textiles, high voltage electrical equipment, electrical wire and cable, wiring systems, motors, fans, blowers, specialty alloys, paints, refractories, tools, forgings and pipe fittings, roll formings and stampings, wire rope and strand.

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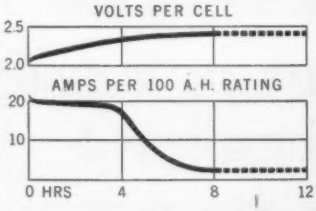

- Fully Automatic Mag-Amp Control. No relays. No moving parts. No timer necessary. **Virtually maintenance free.**
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Books

What Is Field Theory?

Electromagnetic Theory and Engineering Applications. By John B. Walsh. Published by Ronald Press Co, 15 E 26th St, New York 10, N. Y. 286 pages, illustrated. Price $8.50.

Electromagnetic field theory is developed through vector analysis rather than the differential equations approach. Static fields are also treated, with emphasis on techniques used. The relationship between field and circuit theory is used as a base upon which to build a knowledge of transmission line applications. Traveling waves, reflections, standing waves and matching are included.

The author has succeeded in explaining the nature of field theory necessary to an understanding of the concepts underlying wave phenomena. A background of calculus and college physics is required.

How to Wire It

Electrical Systems Design, 2nd Edition. By Joseph F. McPartland and the editors of *Electrical Construction and Maintenance.* Published by McGraw-Hill Book Co, 330 W 42nd St, New York 36, N. Y. 220 pages, illustrated. Price $7.75.

The second edition of this handy "nuts and bolts" volume brings construction practices abreast of advances in design and changes in the National Electric Code. Among the areas covered are lighting and appliance circuits, motor circuits, feeders, transformer layouts, service entrances and residential wiring. Step-by-step procedures, with appropriate illustrations, are shown for selecting proper design, using equipment and hardware, and incorporating the system within the building. Commercial, industrial, and residential wiring are thoroughly covered.

Microwave Theory

Topics in Electromagnetic Theory. By Dean A. Watkins. Published by John Wiley & Sons, Inc, 440 Fourth Ave, New York 16, N. Y. 118 pages, illustrated. Price $6.50.

This concise volume is of primary interest to microwave engineers, and features basic mathematical approaches to a specialized subject. Periodic transmission systems, propagation on a wire helix, coupling of modes of propagation, and anisotropic media are covered.

The book was developed for use in a graduate course covering microwave phenomena. Its value for transmission engineers is limited.

Atomics Viewed From Abroad

Atomkraft, 3rd Edition. By F. Muenzinger. Published by Springer-Verlag, Heidelberg Platz 3, West Berlin, Germany. 290 pages, illustrated. Price DM 42 ($10.50). In German.

As a critical introduction to atomic power plants for engineers, economists and politicians—and this is Muenzinger's expressed purpose—*Atomkraft* succeeds admirably. The engineer-author has slanted it toward his own kind, hence the non-technically inclined will find it tough going. But this is made to order for the engineer seeking an introductory work (in German) on nuclear plants and engineering. It covers the nuclear-physical fundamentals; engineering principles, liberally illustrated by descriptions of reactors built and building; and nuclear-power economics. This last-named section brings in the critical element of the work, for here the author sets down without camouflage his plea that, while the US and USSR have the funds for broad nuclear construction programs now, Germany ought to go slow in building an atomic industry for a market that is years away for both domestic and export sales.

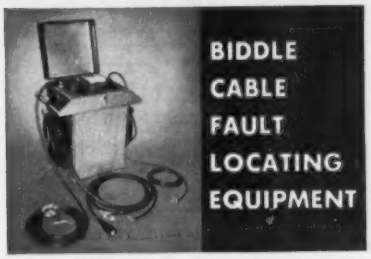
A final section, new in this edition, covers nuclear drive for ships, planes and other transportation vehicles. All sections have been expanded over the second edition. The major additions are discussions of fusion and descriptions of recent plants.

Describes TVA Steam Plant

The Johnsonville Steam Plant. Published by Tennessee Valley Authority, Knoxville, Tenn. 678 pages, illustrated. Price $5.00.

TVA's Technical Report No. 31 describes in close detail the first six units of this steam plant project from planning through design and construction to first operation, with a further

...For Locating Faults in Lead-Covered Cable
...For D-C Proof Testing



Has applications on aerial, or buried cable, as well as on lead-covered cable installed in ducts. Equipment combines a high-voltage capacitor discharge transmitter with a detector to form a complete Tracer Current Set. Provides high current and voltage output with small energy input. Equipment is moderate in size, weight and cost. Use is not restricted by networks or branches, and under certain conditions will even operate successfully without disconnecting transformers. Method of detection indicates whether fault has been reached or passed when an exploring pick-up coil is applied at various points along the cable.

Biddle Models	Output Voltage	Discharge Capacitance
Catalog 651125	Up to 25 KV	1.65 muf
Catalog 651015	Up to 15 KV	2 muf
Catalog 651005	Up to 5 KV	16 muf

B-1005 **Write for Bulletin 65-W**

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New 3/4-ton model
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ACCO

Write to York, Pa., office for complete information

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section covering costs. The 750-Mw installation covered was completed in October, 1954. Four units have been added since. This report includes 90 engineering drawings and is intended for power plant designers.

British Register Reissued

Electrical Who's Who 1960-61, 6th Edition. Compiled by *Electrical Review*. Distributed by Iliffe & Sons Ltd, Dorset House, Stamford St, London, S.E.1. 566 pages. Price 36s 9d by mail.

This register, in typical who's who fashion, presents 468 pages of brief biographies of men in the British electrical industry, an obituary and a cross index arranged by organizations and firms.

Books Recently Received

How to Use Meters. By J. F. Rider & Sol D. Prensky. Published by John F. Rider Publisher, Inc, 116 W 14th St, New York 11, N. Y. 216 pages, illustrated. Price $3.50.

Electrical Efficiency in Industrial Plants. By Edwin S. Lincoln. Published by F. W. Dodge Corp, 119 W 40th St, New York 18, N. Y. 235 pages, illustrated. Price $9.50.

Progress in Dielectrics. By J. B. Birks. Published by John Wiley & Sons, Inc, 440 4th Ave, New York 16, N. Y. 312 pages, illustrated. Price $11.00.

Electromagnetic Energy Transmission and Radiation. By R. B. Adler, L. J. Chu and R. M. Fano. Published by John Wiley & Sons, 440 Fourth Ave, New York 16, N. Y. 624 pages, illustrated.

Professional Engineer's Examination Questions and Answers. By William S. LaLonde Jr. Published by McGraw-Hill Book Co, 330 W 42nd St, New York 36, N. Y. 594 pages, illustrated. Price $7.50.

Introduction to Matrix Analysis. By Richard Bellman. Published by McGraw-Hill Book Co, 330 W 42nd St, New York 36, N. Y. 321 pages, illustrated. Price $10.00.

Transformers and Generators for Power Systems. By R. Langlois-Berthelot. Published by MacDonald & Co, 16 Maddox St, London, W 1. 546 pages, illustrated. Price £ 3/5 ($9.80).

Fixed and Variable Capacitors. By G. W. A. Dummer and H. M. Nordenberg. Published by McGraw-Hill Book Co, 330 W 42nd St, New York 36, N. Y. 281 pages, illustrated. Price $10.00.

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New Computer Serves Upstate NY Utilities

A large economic dispatch computer to control power interchange with other utilities and maintain efficient system operation has begun operating at Niagara Mohawk Power Corp in Syracuse, N. Y.

The analyzer, a mathematical representation of Niagara Mohawk's system, helps dispatch a total of five million kw, taking into account line losses, generator characteristics, and fuel costs.

The computer is used to set generation schedules for Niagara Mohawk and New York State Electric & Gas Corp. It will control nine steam and ten hydroelectric generation stations, one of which is Power Authority of the State of New York's huge Robert Moses Station on the St. Lawrence Seaway project.

It will also provide billing cost data for power interchange between the two utilities and seven other systems with which they are interconnected. The ties, mostly multiple, include interconnections with Hydro Electric Power Commission of Ontario, New England companies, Pennsylvania companies, other New York companies, and PASNY.

Met Edison Dropped From PUC Rate Inquiry

Metropolitan Edison Co got a clean bill of health from the Pennsylvania Public Utilities Commission in its investigation of rates and profits of eleven state utilities. The PUC found that Met Ed's earnings for the year ending March 31, 1960, averaged about 6%, which it does not consider excessive. No set rate of return is provided in state law, but the Pennsylvania Superior Court, usually holds that 6% is a fair return for utilities.

Evidence presented to the PUC showed a plant investment of $233,418,000 and a net of $182,428,000 after deductions for depreciation and other rate-making considerations. Operating revenue for the 12-month period studied was $50,193,000 and operating expense $37,380,000, including taxes. Annual return was $12,813,000.

Earlier in the investigation, Harvey's Lake Light Co agreed to cut charges $25,990 yearly for its 3,429 customers after conferences with the commission's rate staff. Nine other utilities still being studied include Philadelphia Electric Co, Pennsylvania Power & Light Co, Duquesne Light Co, West Penn Power Co, South Penn Power Co, Pennsylvania Electric Co, Pennsylvania Power Co, Waterford Electric Co, and Cumberland Valley Electric Co.

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EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

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EMPLOYMENT OPPORTUNITIES: $25.50 per inch. Subject to Agency Commission.
EQUIPMENT & BUSINESS OPPORTUNITIES: $16.85 per inch for all advertising appearing on other than a contract basis. Not subject to Agency Commission.
AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page.
EQUIPMENT WANTED or FOR SALE ADVERTISEMENTS acceptable only in Displayed Style.

—RATES—

UNDISPLAYED RATE:

$1.80 a line, minimum 3 lines. To figure advance payment count 5 average words as a line.

PROPOSALS, $1.80 a line an insertion.
BOX NUMBERS count as one line additional in undisplayed ads.

DISCOUNT OF 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

Send New Advertisements to Classified Advertising Div. of Electrical World, P. O. Box 12, N. Y. 36, N. Y.

POSITIONS VACANT

Wanted—Manager for rural electric co-op system serving 3200 members, 754 mile distribution line in north-central Indiana, must have executive ability to direct all phases of electric operations. Permanent position carrying substantial opportunity for qualified person. Replies confidential. Write for standard R.E.A. application form Fulton County Rural Electric Membership Corporation, Rochester, Indiana.

Power Plant Superintendent for Municipal Power Plant—14,000 OKW steam and 2910 KW diesel generating units. M.E. graduate preferred. Salary $600-$765 mo. Send complete resume to City Manager, Box 190, Woodstock, Illinois.

Utility Property Accountant—City of Richmond, Virginia—$7,176-$8,500 annually. To assume responsibility for all property records including methods and procedures related to property records for city-owned utilities. To originate and supervise the maintenance of catalogues for plant and retirement units, and general supervision of distribution of property accounts. To review property depreciation to ascertain that adequate reserves are maintained. College graduation with specialization in accounting or business administration and five years of utility accounting experience, some of which must have been in property record accounting. CPA certificate accepted in lieu of college graduation. Apply Director of Personnel, Room 314, City Hall, Richmond 19, Virginia.

Superintendent of Utility Accounting—City of Richmond, Virginia $7,488-$8,970 annually. To assume responsibility for all accounting operations including financial reports, budget forecast, and field reporting for city-owned utilities. To conduct continual review of procedures, devising and installing improved procedures in conformity with FPC and NARUC Uniform System of Accounts. College graduation with specialization in accounting or business administration and six years of utility accounting experience, one year of which must have been at a supervisory level. CPA certificate accepted in lieu of college degree. Apply: Director of Personnel, Room 314, City Hall, Richmond 19, Virginia.

SELLING OPPORTUNITY AVAILABLE

Representative wanted for manufacturer of street lighting equipment pole line specialties. Western States. Full particulars. RW-5056, Electrical World.

EMPLOYMENT SERVICE

Salaried Personnel—$6,000-$30,000. This nation-wide service successful since 1927 finds openings in your field. Sells your abilities; arranges contacts. Address: Jira Thayer Jennings, Dept. E, P. O. Box 674, Manchester, Vermont.

POSITIONS WANTED

Electrical Engineer, BSEE, MBA, 36, 12 years experience in electric utility operations, construction, and system planning engineering. Capable, high potential, friendly. Location open. PW-5084, Electrical World.

Latin America, U. S. field representative residing Panama traveling area seeks representations. PW-5085, Electrical World.

TURBO GENERATOR UNIT

Bids will be received at the Office of the Director of Utilities until 12 noon Tuesday, September 6 on one 500 KW used turbo generator unit complete with all accessories

one 1500 KW same
one 2000 KW same
three boiler feed pumps
(two with turbine drive, one with motor drive)
two 40 HP 490 RPM 2400 volt Westinghouse motors
three 60 HP 880 RPM 2400 volt Westinghouse vertical hollow shaft motors.

Full particulars and invitations to bid may be obtained at the Office of the

Director of Public Utilities
City Hall, City of Gainesville, Florida
or call FRanklin 6-7861

TRANSFORMERS

1—4667 kva Westinghouse, 3/60/115,000Y/72750
1—6000 kva G.E. 3/60/69000/2400/4160Y
1—2000 kva Nia. Askrasi, 3/13800/14160Y/2400
3—1000 kva Westinghouse, 1/22900/480
3—1500 kva Westinghouse, 1/13800/480
3—1000 kva Westinghouse, 1/13800/2400/4160Y
3—1000 kva Standard, 1/44000/6900
3—1000 kva Standard, 1/69000/4160Y/2400
3—1250 kva Standard, 1/34400/480
3— 833 kva Allis Chalmers 1/60/12,000—480
3— 200 kva Westinghouse, 4800—240x480
3— 100 kva G.E., 2400/4160Y—120x240
3— 75 kva G.E., 2400/4160Y—120x240

ERIE ELECTRIC CO., INC.
26 Mechanic St. Buffalo 2, N. Y.

ADDRESS BOX NO. REPLIES TO: Box No. Classified Adv. Div. of this publication. Send to office nearest you.
NEW YORK 36: P. O. Box 12
CHICAGO 11: 520 N. Michigan Ave.
SAN FRANCISCO 4: 68 Post St.

POSITIONS VACANT

Electrical Engineer. Board layout work—power, lighting, and control systems; calculations; and occasional field contacts. Extremely wide variety of work with opportunity to enter consulting field and grow with progressive mid-western concern. P-4617, Electrical World.

Utility Engineers: E.E. and C.E. graduates with five years or more experience in utility engineering, transmission, distribution, or Substation Design, for positions in middle east. Single men or men with small families only. Prefer actual utility experience or consulting experience working with utility companies. Send complete experience and personal record to: Miner and Miner International, Inc., P. O. Box 748, Greeley, Colorado.

Generation and Transmission Cooperative in New Mexico has vacancy for graduate electrical engineer to assist with planning, installation, testing and maintenance of carrier current, supervisory control and radio communication equipment and protective relays. First class radio operators license desirable. Address experience and education record to: Plains Electric Generator and Transmission Cooperative, Inc., 2401 Aztec N.E., Albuquerque, New Mexico.

CHEMICAL ENGINEER

Newly created staff position to strengthen our Power Generation Department. Will work as a member of three-man engineering team. Responsibilities include the giving of advice and technical assistance on generating station fuel combustion, water treatment and other chemical systems, and the use of fuel, steam, gases, lubricants, paints, and other chemical compounds. Degree and previous utility experience preferred. Salary $7000 to $9000, generous employee benefits, and advancement opportunities. Send complete resume for confidential consideration to:

R. C. Pattyn, Vice President
PUBLIC SERVICE CO. OF INDIANA, INC.
1000 East Main Street
Plainfield, Indiana

MANUFACTURER'S REPRESENTATIVES

WANTED

Nationally known Manufacturer of Quality Line of Competitively Priced Wiring Devices seeks Agency Representation in Mid-West and Western States.

Please forward resume including territory covered, experience, references and lines now carried.

Send full details to:

RW-5063, Electrical World
Class. Adv. Div., P.O. Box 12, N.Y. 36, N.Y.

POWER PLANT ENGINEER

Mechanical or Electric Engineer with sufficient experience to supervise operation and maintenance of steam power plant. Personnel Dept., Ark-Mo Power, Blytheville, Ark.

WANTED
ELECTRICAL OPERATING EXECUTIVE

Need retired operating executive, with experience in operation of distribution plant and in management at division level, to operate for about one year, electric utility, which distributes purchased power. Specific duty will be to set up efficient operating force and train successor. Salary approximately $10,000. Location Eastern U. S.

P-5082, Electrical World
Class. Adv. Div., P.O. Box 12, N.Y. 36, N.Y.

At Your Service . . . *These Classified Sections are at your service to bring business needs or "opportunities" to the attention of men responsible technical, engineering and in executive, management, sales and operating capacities with the industry served by this publication.*

Roil Oregon Scene

(*Continued from page* 46)

5% for PGE, which has a uniform rate throughout its service area. PP&L's customers in the Portland area had the same increase as PGE's, but in PP&L's upstate areas increases varied between 10 and 15% for most residential customers. Variations stemmed from a PUC requirement that the new schedules make rural and urban rates uniform.

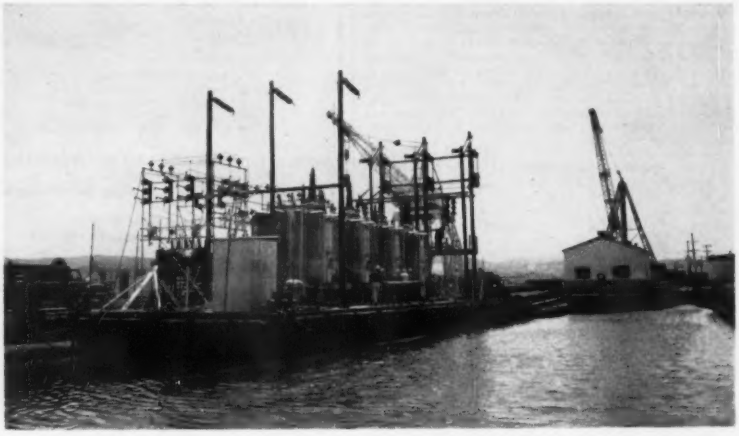
Weather also played a part in some of the public power activity. Because the first increased billings in Astoria came after unusually wet and cold weather, many housewives found bills higher than expected.

Attending the Astoria meeting was Elmer McClure of the Oregon State Grange, who hammered at the rate increase at the Grange convention a few weeks earlier, and called on local granges to support PUD projects found feasible. The Grange supported the Nez Perce project, urged creation of a regional power corporation, and backed the California-BPA tie.

However, in the past, the Astoria area has voted down three PUD and one municipal ownership proposals. Similarly, a PUD proposal in Portland in 1940 was defeated 2.5 to 1. Moreover, no funds for a feasibility study are available in Portland. Similarly, in 1958, city voters defeated nearly 2 to 1 a proposal to authorize a $5-million bond issue to install generators at the city's water supply dams.

The manager of the Salem Electric Cooperative has played a major role in both the Keizer PUD proposal and the Lyons PUD move. At hearings on the two proposals, it was alleged that Manager Jack Frisbie had offered to provide management service to the two PUD's, if they were formed, for about $500 per month. The Keizer PUD petition was filed after PGE successfully opposed a Salem Electric Co-op application to use PGE's poles to enter the Keizer area. Salem Electric's lower rates are attractive to some businessmen in the area.

On the other hand, at Lyons, almost 50% of the residential customers and lumber plants representing 75% of the total electric business have indicated satisfaction with present electric service.



20-Mw Floating Substation Serves Dredge

A 20-Mw floating substation has been built by Pacific Gas & Electric Co to provide power for dredging a portion of Redwood City, Calif., harbor. The 110-kv substation, with four 25-ton, 5-Mw transformers (center), will receive power from PG&E's transmission lines. It will be connected to the dredge by a 12-kv armored submarine cable that can be reeled out as the dredge moves along the channel.

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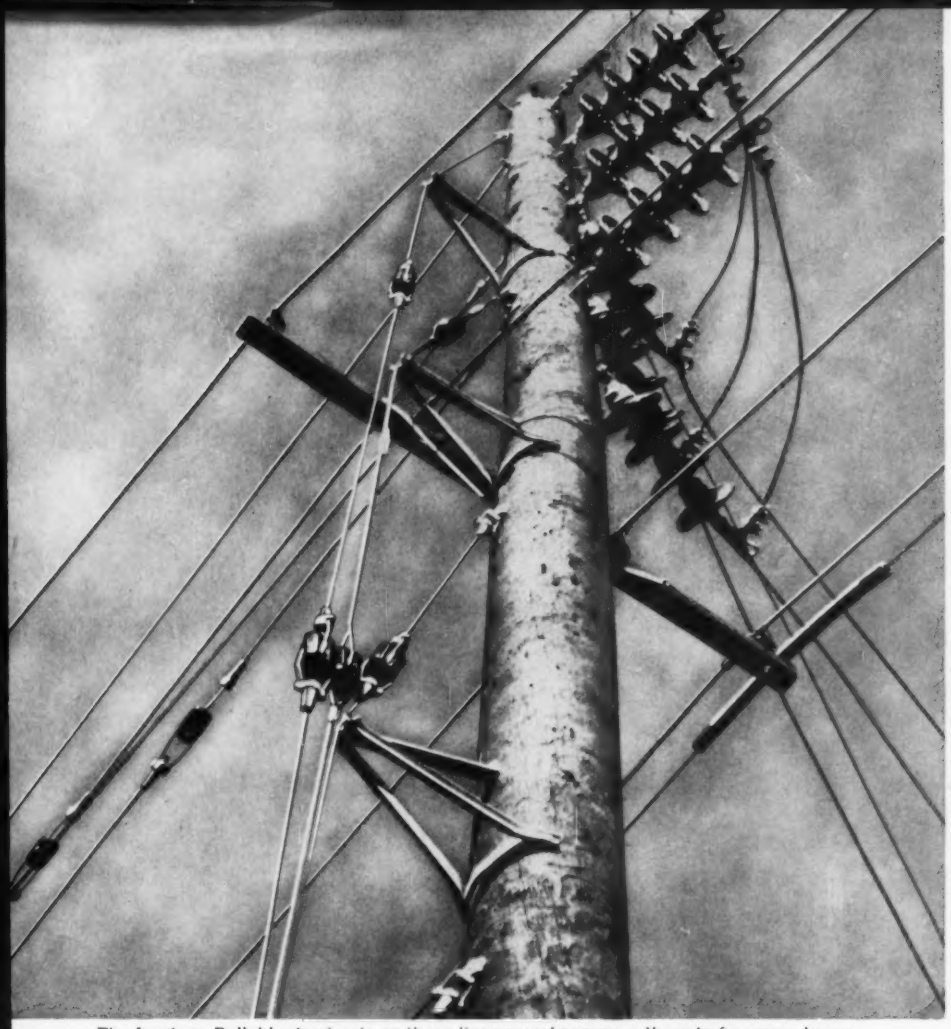
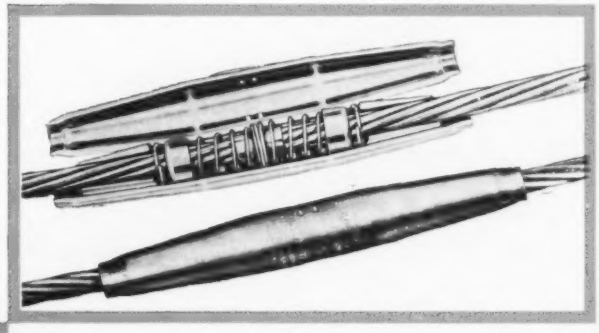


The fourteen Reliable deadends on these lines saved someone three to four man-hours.

TO THE EXECUTIVES IN CHARGE OF SAFETY... AND COSTS

During more than 25 years of continuing production, it has never been reported that a Reliable Feed-Thru Deadend chuck let go a line.

Feed-Thru Deadends are ideal for all working conditions. There are no special tools, no nuts, no bolts, no keepers ... when the work is "hot" they get your men off the lines in the least possible time.



Reliable produces splices that perform like two deadends back-to-back. The conductor feeds completely through the chuck until it reaches the built-in center barrier.

Reliable

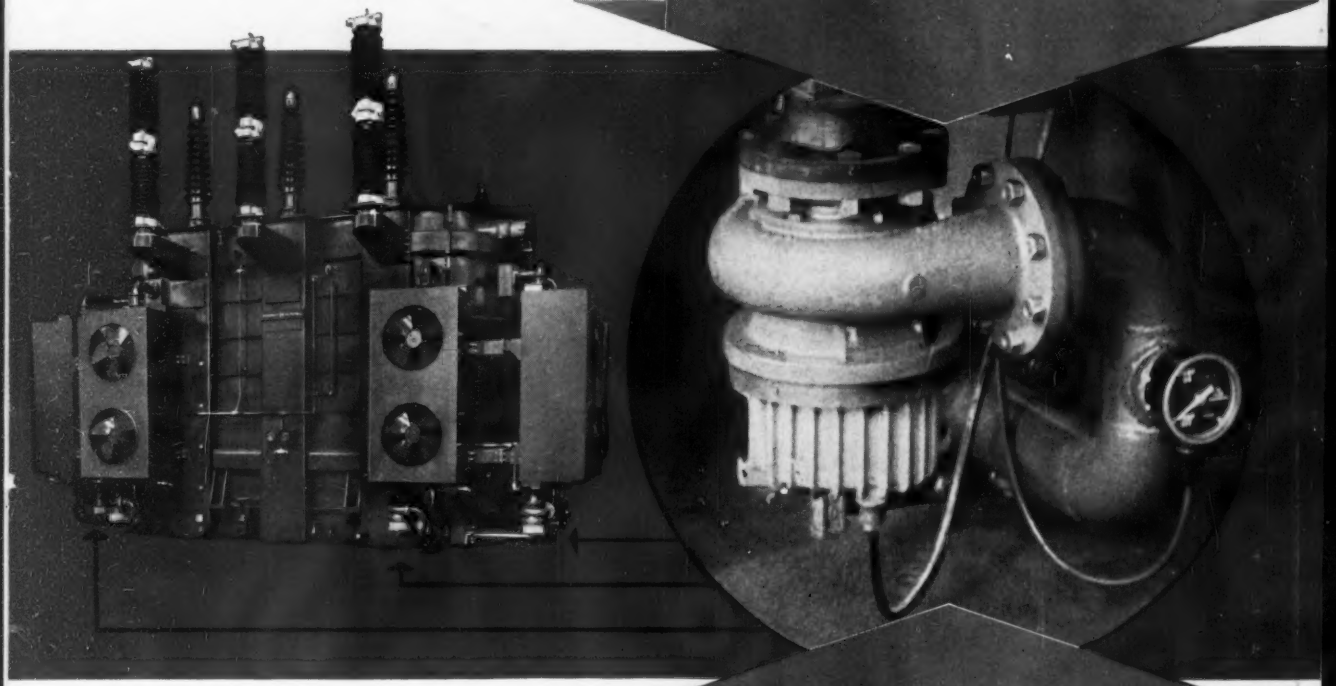
ELECTRIC COMPANY • FRANKLIN PARK, ILLINOIS

A Symbol of Integrity Since 1909

. . NEW . . . EXCLUSIVE . . . NEW . . . EXCLUSIVE . . . NEW . . . EXCLUSIV

ON MOLONEY FOA POWER TRANSFORMERS

A major improvement in FOA equipment is a new lightweight, self-contained, close-coupled pump. This new pump is one-third the weight of former models, thereby reducing total transformer weight. Fewer spare components are needed because this pump is interchangeable with any other pump of the same model. Maintenance is practically eliminated since the pump is self-lubricated and has a smaller gasketed area reducing the possibility of leaks. Installation and replacement of the pump



are facilitated by a power cord and plug attached to the motor.

The lower weight, reduced maintenance, and increased efficiency of this pump are a result of Moloney's continuous program of evaluating components to provide the best transformation at minimum operating cost.

Obtain lower operating cost and superior performance by specifying Moloney Power Transformers.

SELF-CONTAINED LIGHTWEIGHT OIL PUMPS

ME-60-23

MOLONEY ELECTRIC COMPANY

Transformers for Utilities, Industry, and Electronic Applications

FACTORIES: ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

SALES OFFICES IN ALL PRINCIPAL CITIES

MOLONEY ELECTRIC ®